THE GEOGRAPHICAL REVIEW

PUBLISHED BY

JUN 19 1916
UNIV. OF MICH. LIBRARY

THE AMERICAN GEOGRAPHICAL SOCIETY
OF NEW YORK

JUNE

1916

THE GEOGRAPHICAL REVIEW

Published monthly by the American Geographical Society
Broadway at 156th Street, New York, N. Y.

June, 1916

PAGE

The Volcanic History of Etna. By Walter Woodburn Hyde. (4 photos) . 401

The Country of the Shepherds. By Isaiah Bowman. (1 map, 7 diagrs., 10 photos) 419

Plains, Planes, and Peneplanes. By Douglas Wilson Johnson . . . 443

The Non-Existence of Peary Channel. (1 map) 448

The African Colonies of Germany and the War. By Cyrus C. Adams . 452

Geographical Record 455

North America

Reindeer Experiments in Canada 455
The Forest Regions of Central British Columbia 455
Canadian Trade in 1915 455
Geographic Controls in the Development of Minnesota 456
Seismic Activity in California During 1915 456
The Carnegie Institution's Investigations in the Salton and Mohave Desert Regions 457
Migrations of Animal Life Over the Isthmus of Panama 457

Europe

Strategic Features of the Baltic Basin 458
Geographical Conditions in the French Alps in 1700 458
Improvements in Internal Communication to the Port of Marseilles . . 459
A Geographical Commission for Russian Poland 459
Bulgarian and Turkish Mineral Resources 459

Asia

The Turks in Asia 460
Irrigation in the Punjab 460
Operations of the Survey of India 461
Siberian Traffic Problems 461

World as a Whole and Larger Parts

Early Hispano-Japanese Relations 461

Human Geography

Man's Influence Upon the Earth 462
Blackwater Fever and a Specific for It 462

Geographical News

An American Historical Atlas 462
Retirement of Professor Richard Elwood Dodge 463
Personal 463
Obituary 464

Geographical Publications (Reviews and Titles of Books, Papers, and Maps) (1 photo) 466

The Society is not responsible for the opinions or the statements of writers in the Review

Single numbers, fifty cents — Five dollars a year

Entered as second-class matter, January 22, 1916, at the Post Office at New York, N. Y., under the act of August 24, 1912

THE
GEOGRAPHICAL REVIEW

VOL. I JUNE, 1916 NO. 6

THE VOLCANIC HISTORY OF ETNA

By WALTER WOODBURN HYDE
University of Pennsylvania

Etna is the chief landmark of the Mediterranean. Its location near the geographical center of that great inland sea, its huge bulk and commanding height, and its isolation, all render it the most conspicuous natural object of southern Europe. Whether we look up at it from the streets of Catania directly at its base or from a little distance along the shore, from Syracuse or Taormina, or whether we view it from far out at sea, we are struck no less with wonder in contemplating the length of time consumed in rearing such a mass from the original vent on the ocean's floor than with admiration for the beauty of its contour. The loveliness of the view of the volcano across the intervening vale of the Alcantara from the cliffs of Taormina, as its dark cone rises gracefully above the green of its lower slopes, makes us feel with Cardinal Newman a sort of awe arising within us

> That sinful man should see
> Glories far worthier seraph's eyes.[1]

This was the view which the veteran traveler, Sir Henry Holland, recalled in his old age as one of the three finest he had witnessed, comparing it with the peak of Teneriffe and the first sight of Damascus.[2]

It is no wonder that ancient navigators looked upon this lofty pyramid as the highest point of earth—nor were they so far wrong as they knew the world. For, if we except the Alpine chains, only at the extremities of the Mediterranean are higher mountains to be found.[3] And besides, from whatever one of Sicily's encircling seas they viewed it, they could see it for many miles. All this combined to make Etna famed from the earliest times.

[1] Lyra Apostolica, "Tauromenium."

[2] Quoted by A. J. C. Hare: Cities of Southern Italy and Sicily, p. 399.

[3] Etna is 10,758 ft. high. The highest mountain in Spain is Mulhacén (11,421 ft.) in the Sierra Nevadas in the southeastern corner of the country; here is also the Picacho de Veleta (11,148 ft.). The loftiest peak in the Pyrenees is the Pic de Néthou in the Maladetta massif (11,168 ft.); the next highest there are the Posets (11,047 ft.) and Perdu (10,997 ft.). The main range of the Atlas Mountains in Morocco, the High Atlas, has many summits over 11,000 feet, the highest peak, Tiziren, being estimated at 15,000 feet. In Syria, at the other end of the Mediterranean, the highest peaks are in the Lebanon range; thus Jebel Kornet-es-Saudâ is 11,024 feet, and Jebel Tizmarun, 10,548 feet.

FIG. 1—View of Etna from the Greek theater of Taormina.

As far back as the early fifth century B. C., it was called poetically the "pillar of heaven."[4] In the Middle Ages the Saracens named it simply "el Jebel," the mountain; and this practice is still kept up by the Sicilians, who call it either "il monte," or, combining the Italian and Arabic words, "monte Gibello" (Mongibello), the mountain of mountains, which it truly is.

The history of its volcanic activity, though but a tiny fraction of its past, is long and interesting. We have historical records of its eruptions extending back certainly for twenty-four centuries, if not earlier, and numbering well over a hundred. Many of these have lasted over a period of months and done incalculable damage to life and property.[5] There have also been long periods of rest; sometimes these have alternated with those of the neighboring Vesuvius and Stromboli, but more often they have been independent, so that no subterranean connection can be established as existing between them.[6] Nor can any regularity be traced in these outbreaks. Some have been preceded by long premonitory signs, while others have come on with great rapidity. Etna is apparently her own mistress, and her whims yield to no master.

The geological character of few other volcanoes has been so carefully studied. It has aroused in all ages not only the admiration of poets but the interest of scientific observers. Among the Romans many attempts were made to explain the mystery of Etna's fires, and in modern times the phenomena of the mountain have called forth a vast amount of inquiry and study. It will be our purpose here to trace very briefly this long history from the time of Hesiod, who in poetic fashion describes a prehistoric upheaval, down to the last eruption of consequence in the present century.

The convulsions of the volcano were explained by most of the Greek and Roman poets as the struggles of the rebellious giants Typhoëus (Typhon)[7] or Enceladus[8] imprisoned beneath the mountain by the thunderbolts of Zeus. Others saw in the mighty crater the smithy of Hephaestus (Vulcan),

---

[4] Κίων δυράνια (Pindar: Pyth. Od. 1, 36.)

[5] Sartorius von Waltershausen and A. von Lasaulx, in the atlas to their great work, "Der Aetna" (Leipsic, 1880), enumerate 105 eruptions as historically recorded over a period of twenty-six centuries, i. e. between 693 B. C. and 1879 A. D. If the eruptions of 1883, 1886, 1892, and 1910 are added, we would have a total of 109, or one for about every twenty-four years. In this article I have given reasons for placing the first historical eruption in 479 B. C. and not in 693 B. C.

[6] The ancients believed such a connection did exist. Thus Diodorus, v, 7, in speaking of the Aeolian (=Lipari) Islands, says that some maintain there are caverns under the earth running as far as Etna and so conclude there must be communication between them so that they eject flames by turns.

Pliny: Nat. Hist., iii, 14, tells an interesting story, how the people on Strongyle (=Stromboli) predict the winds three days beforehand from the smoke of their volcano and that this is the reason of the myth of Aeolus, the king of the winds; he says the Greeks call these seven (now eleven) islands the Hephaestiades, while the Romans call them the Vulcanian Isles.

[7] E. g. Pindar: Pyth. Od. 1, 31; cf. Ol. Od. 4, 1, and Strabo, xiii, 4, 6 and v, 4, 9 (in the latter passage the geographer says the poet placed Typhoëus under the whole area from Cumae to Sicily); Aeschylus: Prometheus, 354; Ovid: Metamorphoses, 5, 345 *seq.* (1, 353="flammamque ferox vomit Typhoëus"; cf. Fasti, 4, 491="Typhoïs Aetna"); Silius Italicus, xiv, 196; Nonnus: Dionysiaca, xiii, 318-320, and cf. 474 *seq.*: etc.

In the Iliad, ii, 783, we read:—"Among the Arimi, where they say is the bed of Typhoëus"; but the Arimi are a people of Syria and not yet localized in Sicily.

[8] E. g. Vergil: Aeneid, iii, 578: Oppianus (end of second century A. D.); Cynegetica, i, 273: Callimachus: Hymn. in Del., 141, places Briareus under Etna; Horace, Od., iii, 4, 73 *seq.*, mentions the fabled punishment but does not name the giant.

wherein the bolts of the king of gods and men were forged.[9] It is most curious that Homer, though he made the whole region of eastern Sicily the scene of some of the most stirring adventures of Odysseus, makes no direct allusion to the volcanic character of Etna. He pictures the blinded Cyclops as hurling rocks after the retreating ship of the hero,[10] which some commentators, to be sure, have referred to an eruption great enough to hurl rocks from the crater into the sea, or, perhaps, to the breaking of a lava stream over a cliff. In fact, since the days of Pliny, the rocks known as the "Scoglie dei Ciclopi" in the sea a few miles above Catania have been connected with this adventure. But the silence of Homer can be explained best by assuming that the mountain was quiescent in his age. Surely the poets of the Odyssey would not have missed the opportunity to describe so tremendous a natural phenomenon if it had been known to them. It is probable that the lines in the "Theogony" of Hesiod, which describe the fate of Typhoëus, refer to an outbreak of Etna known to the poet:

> When thus the god
> Had quell'd him, thunder smitten, mangled, prone
> He fell; the vast earth groaned beneath the shock.
> Flame from the lightning-stricken prodigy
> Flash'd, 'midst the mountain-hollows, rugged, dark,
> Where he fell smitten. Far and near, vast earth
> With that portentous vapour glow'd intense,
> And melted; . . .[11]

Pindar is the first Greek poet, however, who certainly describes an eruption of Etna. With a few masterly strokes he speaks of the "pillar of heaven, snowy Aetna, nursing the whole year's length her frozen snow" and continues:

"Whereout pure springs of unapproachable fire are vomited from the inmost depths; in the daytime the lava-streams pour forth a lurid rush of smoke, but in the darkness a red-rolling flame sweepeth rocks with uproar to the wide deep sea."[12] A reflex of Pindar's description and that of

[9] E. g. Aeschylus: Prometheus, 366-367; cf. Euripides: Troades, 220; Vergil: Aen., viii, 42 (="Vulcani domus"); Cicero: De divin., ii, 19; Valerius Flaccus: Argonautica, ii, 420; Solinus (second half of third century A. D.): Memorabilia, 11; etc. Lucilius: Aetna, denies this myth; Strabo, v, 4, 9, in speaking of the earthquakes which once drove the inhabitants from the islands of Pithecussae (=Ischia), says this is also the explanation of the story of Typhon imprisoned under Aetna.

[10] Od., ix, 481 *seq.*

[11] 856 *seq.* (Elton); the whole passage is 820-868. The fact that this description was imitated by Pindar and Aeschylus in referring to Aetna makes it probable that Hesiod had the volcano in mind; 1, 860 in the manuscripts (followed by the scholiast and by the Byzantine Greek commentator Tzetzes in his edition of Lycophron, v, 688) reads

οὔρεος ἐν βήσσῃσιν ἀϊδῆς παιπαλοέσσης

Here the word ἀϊδῆς—translated above as "dark"—is generally read by modern commentators as Αἴτνης, which would refer the passage unmistakably to the volcano; thus e. g. Schömann, in his edition of the "Theogonia," p. 244, footnote 2 (though he admits the entire verse is superfluous and probably interpolated). S. von Waltershausen, in his "Aetna," refers the eruption here described by Hesiod to 693 B.C.; he is followed by W. Christ: Der Aetna in der griech. Poesie (1888) and G. de Lorenzo: L'Etna (1907), pp. 26 and 30; the two latter contend also that Pindar and Aeschylus are describing this eruption and not the one of 479 B. C., as I have assumed below.

[12] Pyth. Od. 1, 36-38 and 40-46 (E. Myers). This ode was written in honor of Hiero's Delphic victory of 474 B.C. Hiero had removed the inhabitants of Catania to Leontini in 476 B. C., and repeopled the town

Hesiod already mentioned is found in a grand passage of the "Prometheus" of Aeschylus, in which the proud Titan thus answers the advice of Oceanus, who, with the warning example of what befell a brother giant, urges him to relent and give up his secret and be freed from the rock to which he is fettered:

> Another have I seen
> And mourned for, erst the Earth-born denizen
> Of vast Cilician caves, that monster-foe,
> Now forcibly subdued by power supreme,
> Dread hundred-throated Typhon unappalled
> That stood erect against the heavenly host,
> Hissing red slaughter from his horrid jaws,
> While living lightnings flashed from his eyes,
> As he would storm of Zeus the sovran throne.
> But the ne'er slumbering firebolt, neezing flame,
> Zeus' javelin, descending on him there,
> Down-smote him from his pinnacle of pride,
> And scathed his strength to ashes. Who to-day,
> Stricken to the core, lies by the narrow sea
> A paralyzed and ineffectual bulk
> Pressed beneath Aetna's rock root: where above,
> Under the summit, at his forge unseen,
> Hephaestus sits, hammering the massive ore.
> There one day shall break forth rivers of fire,
> Devouring with all-devastating jaws
> Fair-fruited Sicily's smooth acreage;
> Such turbulent wrath shall boil from Typhon's breast
> Though burnt to cinders by Heaven's thunder-store.[13]

The earliest historical writer to mention an eruption of Etna is Thucydides. In the course of his history of the Peloponnesian War he records that there had been three eruptions of the volcano since the Greeks had settled in Sicily.[14] He says the first occurred in the spring of 425 B. C., when "a fire-flood issued from Aetna as on former occasions and destroyed

with 5000 Syracusans and 5000 Peloponnesians and called it "Aetna"; he did this for a variety of reasons, but chiefly because he wished to be remembered as a founder of a city; so Pindar, 59-60, calls him *κλεινὸς οἰκιστήρ*—"glorious founder," and *Αἴτνας βασιλεῖ*—"King of Etna." (After Hiero's death in 467 B. C., the former Catanaeans returned in 461 and revived the old name; the inhabitants whom they then expelled established themselves in the town of Innesa, which they called Aetna; this is the Aetna of Strabo already mentioned). It is known that Pindar visited the court of Hiero in 474 B. C.; though indebted to Hesiod in his account, as Aeschylus was also, still he may have been describing an actual eruption of his day, perhaps the eruption of 479 and not that of 693 attributed to Hesiod by the authorities mentioned above.

[13] 351 *seq.* (Campbell): many expressions here hark back to Hesiod: e. g. l. 356, "hissing red slaughter from his horrid jaws," recalls *γλώσσῃσι δινοφερῆσι λελιχμότες* of the Theogony, l. 826. Aeschylus may have visited Sicily in 476 to see his "Aetnaeans" played on the occasion of the foundation of Aetna; in any case he was in Syracuse in 474 when his "Persians" was represented in the theater there.

Many later writers and poets have imitated this fine passage of Aeschylus: e. g. Lycurgus, 95: *τῆς Αἴτνης ῥύακος πυρὸς—τοῦτον δὲ ῥεῖν φασὶν ἐπὶ τὴν ἀλλὴν χώραν*; Vergil: Aen., iii, 571-582. Among modern poets I might mention Milton: Par. Lost, i, 232 *seq.*; Byron: Prophecy of Dante, Canto 3; Leopardi: La Ginestra. With the exception of Pindar the ancient poets generally were utilitarian in their admiration, dwelling on the damage done by the eruptions, while the moderns are mostly impressed with the sublimity of the spectacle.

[14] iii, 116.

the territory of Catania''; the preceding one took place fifty years before, which is doubtless the one described by Pindar and Aeschylus and mentioned in the ''Marmor Parium''[15] as happening in 479 B. C. He makes no mention of the date of the third one. These are the earliest historical records of the volcano, which therefore do not antedate the fifth century B. C.[16] After 400 B. C. several eruptions are recorded in Graeco-Roman writers. Of these the chief ones are the following:[17] 396 B. C., when a great lava stream reached the sea on the northeastern base of the volcano;[18] 141,[19] 135,[20] 126,[21] 122,[22] in which Catania was destroyed and a tithe of her territory payable to Rome was remanded for a period of ten years; circa 50,[23]—perhaps just before Caesar crossed the Rubicon in 49 B. C.; 44,[24] mentioned by Vergil as one of the signs of the gods' displeasure at Caesar's untimely death. It is probable that the fine description of an eruption in the Aeneid should also be referred to this date. In this passage the poet gives an account of the usual order of an eruption, mentioning the detonations, clouds of smoke and cinders, the lightning flashes from the crater and the belching out of fire, red-hot stones, and torrents of lava:

> But Aetna with her voice of fear
> In weltering chaos thunders near.
> Now pitchy clouds she belches forth
> Of cinders red and vapors swarth,
> And from her caverns lifts on high
> Live balls of flame that lick the sky:
> Now with more dire convulsion flings
> Displaced rocks, her heart's rent strings,
> And lava torrents hurls to-day
> A burning gulf of fiery spray.[25]

There were also eruptions in 38[26] and 32 B. C.[27] Between the latter date

[15] Frag. Hist. Gr., i, 551.

[16] The statement of Diodorus Siculus, v, 6, that the Sicani before the Trojan war period moved from the eastern to the western part of Sicily because of eruptions of Etna, is probably a mere supposition of Timaeus, whom he quotes, and has no historical value; Dionysius Halicarnassus, in a passage in Bk. I, also says the Siculi of Magna Graecia took possession of the country vacated by these Sicanians.

[17] Cf. article "Aitne" in the Pauly-Wissowa "Realencyclopädie," Vol. I, p. 1111 *seq.*

[18] Diodorus, xiv, 59; Orosius (author of the "Historiae contra Paganos," in seven books, chiefly compiled from Justin, the first attempt at a Christian universal history from Adam to 417 A. D.), ii, 18, 6.

[19] Julius Obsequens (flourished about 309 A. D., and author of "De Prodigiis," an account of portents and prodigies of Roman history from 190 to 11 B. C., in chronological order), 23.

[20] Obseq., 26; Oros., v, 6, 2.

[21] Obseq., 29; Oros., v, 10, 11.

[22] Oros., v, 13, 3.

[23] Petronius: Carm de bell. civ., 122-135, which begins:—

> "iamque Aetna voratur
> Ignibus insolitis et in aethera fulmina mittit."

[24] Georgics, i, 471-473. Servius, in commenting on this passage, quotes Livy: "ut dicit Livius tanta flamina ante mortem Caesaris Aetna defluxit, ut non tantum vicinae urbes, sed etiam Rhegina (=Reggio) civitas afflaretur."

[25] iii, 571 *seq.* (Conington): cf. also Aen., viii, 418 *seq.*; Favorinus (in Gellius, xvii, 10) criticises this description. We know from Suetonius' Life of the poet that he was often in Campania and Sicily, where he must have had opportunities to observe both Vesuvius and Etna.

Doubtless the highly colored account of an eruption which we read in Silius Italicus, xiv, 58-69, is largely indebted to this description of Vergil.

[26] Appian, v, 117.

[27] Dio Cassius, l (i. e. 50), 8.

FIG. 2.

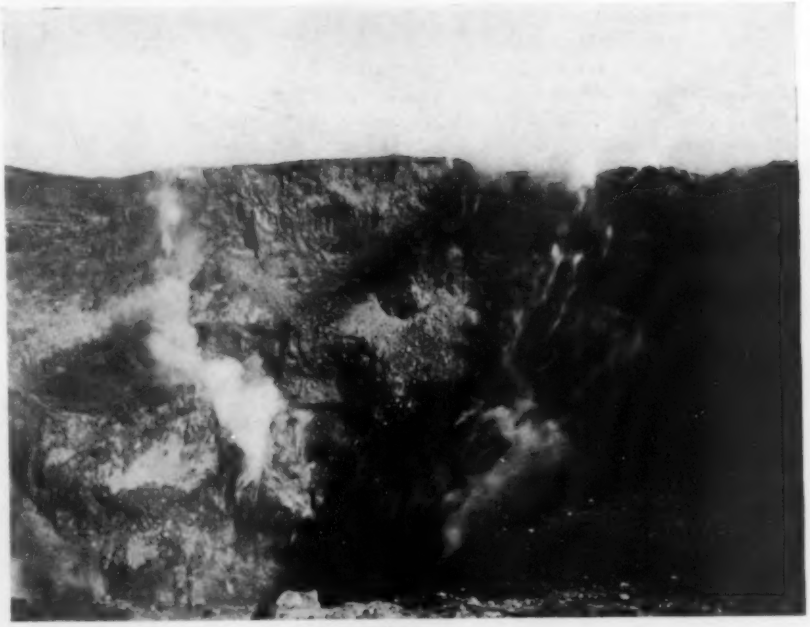

FIG. 3.

FIG. 2—View of the summit of Etna.

FIG. 3—View of the crater of Etna.

and 40 A. D., when an eruption occurred during the reign of Caligula, the volcano appears to have been quiescent. Thereafter no certain records occur for many centuries. In the time of Orosius—in the early part of the fifth century of our era—the mountain was at rest, and its former activity was remembered only because of its smoke.[28] His contemporary Claudian, the last of the classical poets, gives an account of an eruption in his poem "De Raptu Proserpinae," but it is full of exaggerations, as when he says one cannot visit the top of the mountain but must content himself with a view of it,[29] notwithstanding that we know from Strabo[30] and Seneca[31] that ascents were common centuries before.

Already in the first century B. C. the phenomena of the volcano had aroused the scientific interest of Roman writers. The great poet Lucretius (95-52 B. C.) was the first to renounce the poetical idea that Etna's eruptions were caused by the gods and to seek a scientific reason. The following lines are quoted from the "De Rerum Natura" from an eighteenth-century translation:

> And first Nature has formed the whole mountain hollow within, and supports these cavities by arches of stone. Now all the caverns are filled with wind and air; for air, when it is violently moved, becomes wind; and this wind, when it grows hot, and furiously whirling about, has inflamed the stone and the earth by beating upon them, and from them has struck out sparks of fire with rapid flame; then it raises itself up and throws itself violently out of the open jaws at the top, into the air; then it pours the fire abroad and spreads burning embers all about, and belches dusky clouds of rolling smoke and shoots out rocks of wondrous weight. This no doubt is done by furious blasts of wind within. Besides, the sea, for a great way, dashes its waves against the roots of this mountain and then sucks up its tide. The waters press into these caverns that lie directly under those open jaws above; this you must allow; and the flames, yielding to the driving flood, then force their passage out, and fly abroad and cast the fire on high, and throw out rocks and raise whole clouds of sand; for on the summits there are certain basons where wind is generated; the Greeks call them so; we call them mouths and jaws.[32]

Thus the eruptions are caused by the winds whose seeds are from the infinite universe; when they gather inside the mountain, they drive out the flames which lurk there in its bowels and force them out with its very stones: or else the wind, rushing through hollows at the foot of the mountain where the sea ebbs, blows out the flames above; while other winds are generated within the mountain itself. Whatever we think of this as a scientific explanation, we must admire the grandeur of Lucretius' description of the volcano's phenomena.

The poet Ovid (43 B. C.–18 A. D.) seems to have had an inkling of the "upheaval" theory of the origin of volcanoes. In speaking of the volcanic

---

[28] Oros., II, 14.

[29] i, 158-176: he says

> "Aetnaeos apices solo cognoscere visu
> Non aditu tentare licet."

[30] vi, 2, 8.

[31] Epistle 79.

[32] vi, 680 *seq.*

hill of Pittheus near Troezen in the Peloponnesus, he explains how a volcano is formed:

> For—frightful to tell—the raging power of the winds, pent up in dark caverns, desiring to find some vent and having long struggled in vain to enjoy a freer air, as there was no opening in all their prison and it was not pervious to their blasts, swelled out the extended earth, just as the breath of the mouth is wont to inflate a bladder or the hide stripped from the two-horned goat. That swelling remained on the spot, and still preserves the appearance of a high hill, and has grown hard in length of time.[33]

The Augustan historian Justin has a theory about the wind and fire of Etna comparable to that of Lucretius:

> The soil itself (of Sicily), too, is light and frangible and so perforated with caverns and passages, that it is almost everywhere open to blasts of wind; and the very matter of it is naturally adapted for generating and nourishing fire, as it is said to be impregnated with sulphur and bitumen, a circumstance which is the cause that when air contends with fire in the subterranean parts, the earth frequently and in several places sends forth flame, or vapor or smoke. Hence it is that the fire of Mt. Aetna has lasted through so many ages.[34]

It is curious that the naturalist Pliny, who lost his life while observing the great eruption of Vesuvius in 79 A. D., did not turn his attention to an explanation of the phenomena of Etna. In one passage in his "Natural History" he remarks that the mountain is "wondrous for the flames emitted by night";[35] and after giving the circumference of the crater as twenty stades, he mentions the "red-hot cinders thrown as far as Tauromenium and Catania" and adds that the "noise is heard even at Maroneum and the Gemellian hills [=Madonia and the Monte di Mele]." But this is all that he says of the volcano. The philosopher Seneca, near the end of his life (65 A. D.), wrote a letter to his friend Lucilius, who was then procurator of Sicily, and asked him to make certain scientific investigations for him. After requesting him to examine the current of Charybdis and see what foundation there was for the stories told about it, he asked him to make the ascent of Etna and find out if there was truth in the report that the mountain was slowly diminishing in height, since it used to be visible to mariners for a greater distance.[36] He suggests that perhaps this report is based not on an actual dwindling of the summit, but because its inner fires have become weakened and do not blaze forth with their former violence, so that clouds of smoke are not now seen in the daytime; or, as he says (§2): "the mountain may be consumed by being daily devoured, and the fire not be so large as formerly, since it is not self-generated here, but is kindled in the distant bowels of the earth and there rages, being fed with continuous force; not

[33] Metamorphoses, xv, 299 *seq.* (Riley).

[34] Historiae Philippicae, iv, 1 (Watson).

[35] iii, 14: cf. ii, 110.

[36] Epistle 79, §2:—"quam consumi et sensim subsidere ex hoc colligunt quidam, quod aliquanto longius navigantibus solebat ostendi." Cf. Aelian: Var. Hist., viii, 11, for a similar notion: *τῶν ὀρῶν τὰ ὑψηλότατα ἀκούομεν μειούμενα· τὴν γοῦν Αἴτνην φασὶν οἱ πλέοντες ἐξ ἐλάττονος ὁρᾶν ἢ πρὸ τοῦ ἐβλέποντο.*

with that of the mountain through which it makes its passage." However, it is quite possible that the cone had actually diminished in his day as it has done on several occasions in modern times. Thus Alessi[37] quotes Falcando as saying that the cone fell in 1179 and Fazello (or Fazelli)[38] that it was destroyed in 1329; he also records that it was engulfed in 1444 and that the whole top fell in during the great eruption of 1669. We know that the tableland, or *piano*, at the base of the present one is merely the result of truncation, which shows that this cone is recent. Its present size points to the fact that once a bigger one—rising perhaps five or six hundred meters higher[39]—stood upon it at some former time, perhaps prehistorically. As the present cone is composed of both cinders and tufa, it has undergone many changes in the past.

Seneca in the same letter (§3) also asks Lucilius to describe Etna in verse, as Vergil, Ovid, and Cornelius Severus had already done. In §5 he says: "It is a subject, moreover, so happily copious that they who have gone before seem by no means to have expanded it, but to have opened matter for further explanation." And so he requests him at least to introduce the hackneyed theme as an episode in some contemplated poem, if he does not wish to make it the subject of separate treatment. Now, a didactic poem entitled "Aetna," in 644 hexameters, has come down to us, and though it has been ascribed variously to Vergil, Severus (the Augustan epic poet), Manilius, and others, it seems, because of its length and importance, to be the very poem which Seneca invited Lucilius to write.[40]

This poem, though it suffers from the unpoetic character of the subject and grave faults of style, is the most detailed and scientific description of any phase of nature which has come down to us from antiquity.[41] The

[37] Storia Critica dell' Eruzione dell' Etna, p. 149.

[38] Author of "Histoire de Sicile" (1574).

[39] Cf. Nouveau Dictionnaire de Géographie Universelle, Vol. 2, p. 224 (Paris, 1884).

[40] The proposed date of the "Aetna" ranges over a hundred years, from 44 B. C. to 79 A. D.—the latter the date of the eruption of Vesuvius, the greatest exhibition of volcanic forces recorded in antiquity and a spectacle which would not have been passed over in silence in such a poem. The earliest notice of such a work is found in Suetonius' "Life of Vergil," and so the "Aetna" was at first ascribed to that poet, as in the oldest manuscripts of it (dating from the tenth century) in the University Library at Cambridge. Recently a Hungarian scholar, Kruczkiewicz, in "Poema de Aetna Monte" (1882) has revived this older Vergilian authorship on the ground that certain works of art known then to have existed in Rome are referred to in the poem as away from the city; on the same argumentation Alzinger: Studia in Aetnam collata (1895) thought the poem was pre-Augustan; Scaliger, in 1572, because of Seneca's statement, referred it to Cornelius Severus, who is known to have composed a "Bellum Siculum." Barth referred it to Manilius, while Wernsdorf, in his "Poetae Latini Minores" (1785), Vol. IV, was the first to attribute it to Lucilius; he was followed by Jakob, in his edition of 1826, and this theory has been followed in recent years by H. A. J. Munro: Aetna (Cambridge, 1867) and Ellis: Aetna (Oxford, 1901) and is the prevailing view now. For the authorship of Lucilius it may be said that, apart from the evidence of Seneca's letter, the author shows an acquaintance with the philosopher's "Quaestiones naturales," written in A. D. 62-65 (according to Teuffel), a work which was addressed to him; that Lucilius was Seneca's friend and knew the locality and wrote a book on Sicilian subjects. So the best date for the "Aetna" lies between 65 and 79 A. D.

For a full account of the date, authorship, and analysis of the "Aetna" see the edition of Ellis: Prolegomena, pp. xxi-cili, and his article in *Journal of Philology*, Vol. 16, p. 292 *seq.*

[41] It displays a knowledge of Lucretius, the pseudo-Aristotelian treatise "De Mundo" (referred to the first century B. C. by Zeller), Posidonius of Apamea, and Seneca. It mentions the small cone in the center of the crater (v. 182-" penitusque os erigit ultra") which Strabo describes, as also the cloud rising from it (vv. 333-335).

author essays to give a scientific account of the phenomena of the volcano, scouting the poetic notion that (verses 29-73) Etna can be the home of a god or that Vulcan can have his forge there or the Cyclopes their workshop or that it can have aught to do with any of the Titans. He describes a former eruption (198-206): "A cloud of ignited sand is driven out in a whirl; burning masses hurry up, the substructures are rolled from the bottom; at one moment a crash bursts from every part of Aetna, at another wan flames mingle with black falling débris . . . . . but meanwhile the whole ground outside is strewn with a crowd of rocks and loose sands."[42] The agents in all this are wind and air—or more exactly spirit (*spiritus*, v. 212), which is the name of air in its tense forms, for without it fire is helpless. Inquiring (218-221) whence this wind comes to feed the flame and why its fury sometimes subsides, he says (300-304) that the particles of air and spirit jostle one another inside the mountain and, in the struggle to escape crowding, drag with them everything that stands in the way. Periods of quiescence prove that the winds which cause explosions come from within and not from without (328-356). Wherever an obstruction, such as a mass of rocks, occurs in the channels through which the spirit passes, then the volcano is quiet (373-375); but such delays only increase the subsequent outbursts (378-383), and thus we have desolating streams of lava, when all the inflammable substances in Etna—sulphur, bitumen, alum—burn (385-391). The special property of lava stone, or *molaris*—the chief component of the mountain—is to conserve fire with great tenacity,[43] this being unlike other substances, which, if once burned, cannot be rekindled (398-423); though the volcano's sides are covered with it, that which is within is more potent (449-459). He next gives the premonitory signs of an eruption, the crackling of the ground, the low murmur from the mountain's depths and the flame (460-462); these are followed by the eruption itself, when masses of burning rocks are heaved into the air and shoals of black sand are driven up to the stars and take on curious shapes (465-473). These ejected stones are dirty, rugged, and melting and pour down the slopes in a fiery flood—sometimes for twelve Roman miles; nothing can stop their course, everything is absorbed and consumed by these lava streams (474-489). But by degrees they cool and harden, and if they strike an object, sparks are thrown off (496-504). In short the scientific explanation of an eruption is this (565-566): the earth draws in forces through the holes which pierce it; spirit presses these into a confined space, and then the fire works itself a passage through rocks of the largest size.

Toward the end of the poem (567-601) the author says men travel over

---

[42] The translations are by Ellis, *op. cit.*

[43] vv. 398-399:—

"Sed maxima causa molaris
Illius incendi lapis est, is vindicat Aetnam."

Because of this fact Pliny: Nat. Hist., xxxvi, 137, says it was called πυρίτης (pyrites)=firestone:—"molarem quidem pyriten vocant, quoniam sit plurimus ignis illic." This "molaris" (μυλίας) was used for millstones. Theophrastus: Frag. de lapidibus, 22 (ed. Wimmer) says the color of Aetna's lava stone was black; Posidonius (*apud* Strabo, p. 269) says the same thing.

FIG. 4—The Valle del Bove, the huge fissure near the top on the eastern side of the volcano.

land and sea to visit famous temples and shrines and historic cities to see their works of art, but that none of these sights can rival the stupendous manifestations of the supreme artificer Nature; and nowhere in the crowded world of men can you see a sight so marvelous as here at Etna. He then describes a recent eruption—perhaps that of 40 A. D., in which Catania was destroyed—and says that the mountain, notwithstanding it has a series of crimes behind it, has one pious memory which atones for its guilt (602 *seq.*); for during an eruption, when everyone was selfishly striving to save himself, two brothers of Catania, seeing that their parents could not escape because of their infirmities, lifted them upon their backs and resolutely confronted the flames. The fire gave way on every side and they were saved.[44]

As already stated we hear little of the volcano in Roman literature after the time of Lucilius. Not until the twelfth century do the records of eruptions become common again. The most destructive since that date have been those of 1169, when a large portion of Catania was destroyed, including the cathedral with its bishop and congregation; 1185, when 15,000 people are said to have perished; 1665, when lava fell from the central crater to such an extent that it has been computed at 92,000,000 cubic meters;[45] 1669—perhaps the worst eruption recorded in the history of the mountain, when forty towns were wholly or partially destroyed with a population variously given as from twenty to sixty thousand, and when lava was belched forth in quantities reckoned at 980,000,000 cubic meters;[46] 1693, accompanied by an earthquake which nearly destroyed Catania; 1755, the year of the Lisbon earthquake; 1792, described scientifically by Ferrara.[47]

In the nineteenth century nineteen eruptions were recorded, an average of one for nearly every five years. The worst of these occurred as follows: in 1812, lasting six months; 1819, lasting two months and described by an eyewitness, Gemellaro of Catania;[48] 1832, when the village of Bronte on the northeastern side of the mountain narrowly escaped destruction; 1852-53, extending over a period of ten months, when the mountain cast forth a volume of lava computed at 420,000,000 cubic meters;[49] 1865, the best

[44] The same legend of the pious brothers is told by many other writers: e. g. in the De Mundo, vi, 33; Strabo: vi, 2, 3: Conon: Narrat., 43; Silius Italicus, xiv, 197; Seneca: De Beneficiis, ii, 37 and vi, 36; Claudian: De Rapt. Pros., xvii, 35.

[45] Thus in von Waltershausen: Der Aetna, Vol. II, p. 393.

[46] See Der Aetna: in the same passage the authors speak of a prehistoric eruption when lava fell computed at over a billion cubic meters. The eruption of 1669 should be compared with that of Krakatoa (a little island in the Sunda straits between Sumatra and Java), which occurred in August, 1883, when 30,000 to 40,000 people were drowned in a tidal wave. This has been called "the most violent and destructive event of the kind in history."

[47] See his "Storia Generale dell' Etna" (Catania, 1793) and "Descrizione dell' Etna" (Palermo, 1818).

[48] He states that five openings were made on the sides of the central cone; from which flames, red-hot lapilli, and sand were ejected; streams of lava combined with fire flowed down into the Valle del Bove and on through it to the head of the valley of Catania, where it poured, a hardened mass, over a cliff to the bottom with a deafening roar.

[49] Cf. Der Aetna, *loc. cit.*

written-up account of an eruption in the history of the volcano,[50] during which the town of La Macchia above Giarre on the northeastern base was destroyed by earthquake; 1879, lasting from May 26 to June 6, during which time a new crater, now known as Monte Umberta Margherita, 4,705 feet above the sea, was formed on the northern slope, from which lava, having a superficial area of about 2,720,000 square yards, poured down almost to the Alcantara; 1892, when a crater opened near Monte Gemellaro and a lava stream flowed southward with an initial velocity of 380-540 feet per hour, which reached within one and a quarter miles of Borelli and two and one-half of Nicolosi. A dangerous eruption also occurred in 1910.

In order to convey an idea of what an eruption of Etna is like, a brief description will be given of that of 1669, the most stupendous in the history of the volcano; and in conclusion the volcanic activity of the mountain in the last few years will be reviewed.

The eruption, beginning at the end of April, 1669, was the first to be carefully studied on the spot by a scientific observer, the naturalist Borelli.[51] It was accompanied by remarkable phenomena. Every house in Nicolosi was destroyed by an earthquake, and the fields above the town were converted into a fiery lake of lava which enveloped a part of the hill of "Monpilieri," which stopped the stream for a time; but it soon divided into three branches, the chief of which finally reached Catania—one of the longest on record.[52] Its rate of speed was variable; in some places it flowed as fast as fifteen hundred feet per hour, whereas in others it made only a few yards in days. Thus it is said to have run the first thirteen miles in twenty days, or an average of about 162 feet per hour, while it took twenty-three days for the last two miles, or twenty-two feet per hour. It took eight years to cool.[53] Where it approached the sea the stream was six hundred yards in breadth[54] and forty feet in depth and contained some 3,532,000,000 cubic feet.[55] When this gigantic river of molten matter reached Catania, it flowed over the sixty-foot city wall in a fiery cascade and destroyed a large section of the town. The inhabitants forthwith

[50] See Elisée Reclus: La Sicile et l'éruption de l'Etna en 1865, *Le Tour du Monde*, Vol. 13, 1866, pp. 353-416; M. F. Fouqué: Rapport sur l'éruption de l'Etna en 1865, *Archives des Missions Scientifiques et Littéraires*, 2nd Ser., Vol. 2, 1865, pp. 321-357; and Rapport sur les phénomenes chimiques de l'éruption de l'Etna en 1865, *ibid.*, Vol. 3, 1866, pp. 165-246.

[51] Borelli (1608-1679) published his "Meteorologia Aetnea" in 1669. This eruption is also described in detail by Ferrara, *op. cit.*, and briefly by Lyell: Principles of Geology (11th edition, 1873-74), Vol. I, pp. 21-23, and Reclus, *op. cit. infra*, p. 312. The Earl of Winchelsea, British ambassador at the Porte, visited Catania on his way home to England at the very time of the catastrophe and published his account in 1669 (London); a portion of this work is quoted by Sir Wm. Hamilton: Observations on Mt. Vesuvius, Mt. Etna, and other Volcanoes (Series of Letters addressed to the Royal Society, London, 1772), p. 60 *seq.* Among other things the Earl states that in forty days the habitations of 27,000 people were ruined and that out of 20,000 inhabitants of Catania only 3,000 were left!

[52] The Earl of Winchelsea gives its dimensions as fifteen miles long and seven broad.

[53] Some lava streams have taken even longer; thus Hoffman—quoted by Geikie: Text Book of Geology (3rd ed., 1893), p. 228—states that steam was still rising in 1830 from lava which dated from 1787.

[54] The Earl of Winchelsea says it was a mile in breadth and extended into the harbor for 600 feet.

[55] Elisée Reclus: The Earth and Its Inhabitants: Europe, Vol. I, p. 312 (New York, 1882); this is 130,814,444 cubic yards.

brought out the veil of St. Agatha, and the stream was deflected to the southeastern part of the city and flowed into the sea, forming a huge promontory which has acted ever since as a breakwater against storms and formed the only real harbor Catania ever has had.

During this eruption two apertures appeared a little west of Nicolosi, and sand and scoriae were gradually thrown up to such an extent that within three or four months the twin cones called "Monti Rossi," or red mountains, were raised some 450 feet above the side of Etna. A fissure six feet wide and of unknown depth stretched from the plain of San Leo for a distance of twelve miles to within one mile of the summit; its sides were covered with incandescent lava. A little later five parallel rents appeared and gave forth a noise that could be heard for forty miles.

The English traveler Brydone tells a very curious story of this eruption. A stream of lava encountered a vineyard which had been planted over an ancient bed; soon the crevices were filled up with the liquid, until the vineyard gradually began to move bodily, and it was carried on the surface of the stream for some distance, and though it was for the most part destroyed, a portion of it was still in existence in 1770 when Brydone saw it.[56]

Between 1883 and 1910 the volcano has shown a great deal of activity. Every eruption without exception has occurred on the southern slopes. In 1883, preceded and accompanied by earthquakes, a radical fissure running north and south opened from the central crater, though it proved abortive. In 1886 along this same fissure an eruption took place which lasted nearly three weeks. On May 18 of that year dense clouds of steam and ashes rose from the central crater; the next morning an earthquake occurred on the southern slope and a new crater, now known as Monte Gemellaro (4,650 feet above the sea), was formed northeast of Monte Concilio, four and a half miles above Nicolosi, from which steam, ashes, and molten stone came with loud detonations. From the southern base of this crater lava flowed for seventeen days in the direction of Nicolosi at the rate of 160 to 190 feet per hour. The inhabitants of the village carried the pictures of their three patron saints from the church to the "Altarelli," the open chapel which stands on an eminence a mile above the town. But as the lava continued to advance, the bishop of Catania on the evening of the twenty-fourth brought up the veil of St. Agatha. Three days later the lava had reached the "Altarelli" but had then divided and stopped, for it had expended its force. Still another stream flowed along the eastern side of Monti Rossi, headed for Nicolosi, but stopped on June 3 within 370 yards of it. The following day the eruption ended with an earthquake. A thousand acres

[56] A Tour through Sicily and Malta (Series of letters to Wm. Beckford, Esq., 1773), ed. of 1806, p. 95; Borelli tells the same story more scientifically and dates the occurrence April 4, 1669; Sir William Hamilton, p. 85, also mentions having seen the vineyard; he says it was moved a half mile with little damage to the vines. Perhaps such a phenomenon was intended by Lucilius: Aetna, 488, who speaks of the forest and cliffs swimming:—

"Nunc silvae rupesque natant, hic terra solumque."

of fertile soil had been desolated by the heated lava and turned into a hell.[57]

In 1892 another eruption took place in the old fissure of 1883. Four large craters were formed besides several smaller ones, and the activity of the mountain continued for six months.

Again on July 19, 1899,—six weeks after the writer's visit to the summit—an explosion, accompanied by slight earthquake shocks, took place in the central crater, and a gigantic pine-shaped cloud of steam and ashes rose to a height of 5,000 meters[58] over the summit and deposited a layer of ashes on the southeastern slope as far as the village of Zafferana. A "red rain"—the water being stained by the acid in the ashes—fell upon the summit, though little damage was done below.[59]

In the spring of 1906 Vesuvius began an intense activity, and the villages of Somma, Ottajano, and Giuseppe were threatened; houses in Bosco Trecase and Bosco Reale were destroyed by a lava stream and the streets of Naples were covered with ashes. Two years later, in April, 1908, an eruption occurred on the southern slope of the Valle del Bove on Etna lasting under twenty-four hours; earthquakes took place, but no new craters were formed and but little lava appeared. It was on December 21 of this year that the earthquake occurred which destroyed the two cities of Messina and Reggio on opposite sides of the strait which separates Sicily from Italy. According to the official record of the Italian government there were 96,871 deaths. At the same time both Stromboli and Etna showed signs of trouble but kept fairly quiet.

In the spring of 1910 Etna again became active.[60] In the early morning of March 23 slight earthquake shocks and detonations occurred which caused but little anxiety. At 8.15 A. M. above the Piano del Lago a thin column of steam, of the usual pine-tree shape, appeared. A large fissure, over that of 1883, extended from Monte Castello for two kilometers to the western base of the Montagnuola, on which many craters—over twenty in number during the next few days—formed, which emitted lava, incandescent lapilli, and "bombs," together with clouds of steam and dust. Most of the inhabitants of the villages on the slopes of the mountain still had a

[57] Lava often reaches 2,000° Fahrenheit.

[58] Whymper: Travels Among the Great Andes of the Equator (1892), records that a cloud of volcanic dust rose 28,000 feet over the summit of Cotopaxi. Geikie, *op. cit.*, p. 194, says that steam constitutes 999/1000th of the cloud that hangs over a volcano; Fouqué, in his "Santorin et ses éruptions" (Paris, 1879) calculates that during 100 days one of the parasitic cones of Etna ejected enough vapor to form, if condensed, 21,000,000 cubic meters, which is 462,000,000 gallons, of water.

As for solid matter hurled from the top of Etna, stones are known to have reached 6,000 feet above the summit, and thirteen-ounce stones have been found fifteen miles away from it. In 1669 a stone containing fifty cubic feet was cast from the crater and landed a mile away; at the same time ashes fell upon the island of Malta, 125 miles away.

[59] See account of this eruption in *Nature*, Vol. 61, 1899, Dec. 21, p. 185.

[60] This account is taken from a contemporary magazine description and from that of Signor A. Ricco—the director of the Etna Observatory—in *Nature*, Vol. 83, 1910, June 2, pp. 399-400; cf. also reports in the same volume, March 31, pp. 135-136, and April 17, p. 165. At the beginning of his article on p. 399 Ricco gives a brief summary of conditions on the mountain since the fissure of 1883 appeared.

lively remembrance of what had happened in 1886 and 1892, and so every town, even Catania, was thrown into fear. The military was pressed into service to help the peasants to transport their belongings to safe distances. Processions, headed by priests bearing sacred relics, were everywhere visible.

By the 24th conditions became worse. First a stream of lava from the highest point of the fissure, near the Observatory, belched forth, forming a river 1,500 feet wide, which flowed at the rate of sixty or more feet per hour for a distance of two kilometers; it has been computed that it contained 20,000,000 cubic meters of lava. Later lava flowed mostly from the lower craters (from Volta di Girolamo, about 7,000 feet up the mountain) and formed a river of molten rock one hundred and fifty feet wide, which descended southward until it reached the eastern side of Monte Faggi, two kilometers below, and formed a magnificent cascade thirty-five feet wide and seventy high. As it passed southwest, it skirted Monte Sona on the east and then descended southward through the gorge between Monte San Leo and Monte Rinazzi, slowly diminishing in speed. In some places this river was from one hundred meters to a half kilometer in width and one kilometer in depth.

On top of Monte Castellazzo stands the "Casa Cantoniera"; here scientists and observers had taken their station; but soon the base of the hill was almost surrounded by lava, which in places rushed down thirty feet a minute, and so they had to leave in haste. By March 25 the eruption grew more violent; five new craters were formed and the lava stream grew larger though it moved more slowly. By the 27th it had diminished and ceased to flow, but the next day it began again. Just below the "Casa Cantoniera" the lava flowed over a portion of the stream of 1763, and then slowly pushed around Monte Palombaro and divided into three arms; one moved toward Monte San Leo near by; the second toward Monti Rossi and Nicolosi and the third—already described as passing down along Monte Rinazzi—by the end of the month was running at the rate of 120 feet per hour toward Cisterna Regina and the village of Borello. Here hundreds of military wagons had assembled to rescue people and their goods. The easternmost lava stream had surrounded the "Casa del Bosco" on Monte Rinazzi; the other two joined and drove on at the rate of fifteen feet per minute toward Monte Nocilla and the village of Nicolosi. By the 31st the streams had reached Borello and Belpasso and one-half a mile nearer Nicolosi; they had destroyed great quantities of gardens, vineyards, and woodlands near these villages.

All this time Professor Ricco was in the Observatory; he had to leave on April 2; but by April 4 the eruption had decreased, only to start up anew the following day. The town of Cavaliere was covered with ashes; the fertile region of Cisterna Regina was utterly destroyed. Down in Catania processions were formed carrying the veil of St. Agatha from the

Cathedral to the church of Santa Maria through showers of ashes. The stream that was moving on Borello finally stopped less than a mile away; the eastern one, moving on Nicolosi, stopped near where the lava of 1886 had reached. By April 6 the lava from the lower craters reached the farthest point below—a distance of ten kilometers, while the higher streams continued to flow until the 20th. Thus the eruption of 1910 lasted over a period of twenty-nine days. But the detonations did not cease for several weeks. It is said that the peasants even yet can boil water over the lava in places. Decades must pass before the ground can be planted again—one more repetition of what has been going on for ages past in the evolution of Etna.[61]

[61] Besides the various works on Etna mentioned in the foregoing pages, the following books should be noted: G. F. Rodwell: Etna. A History of the Mountain and Its Eruptions (London, 1878); O. Silvestri, Professor and former President of the Club Alpino Italiano in Catania: Un Viaggio all' Etna (Rome, 1879; E. Chaix: Carta volcanologica e topographica dell' Etna, 1:100,000 (Geneva, 1892), indicating all the lava streams down to 1892.

THE COUNTRY OF THE SHEPHERDS*

By ISAIAH BOWMAN

The lofty mountain zones of Peru, the high bordering valleys, and the belts of rolling plateau between are occupied by a race of shepherds. In that cold, inhospitable region at the top of the country are the highest permanent habitations in the world (17,100 feet), the loftiest pastures, the greatest degree of adaptation to combined altitude and frost. It is here only a step from Greenland to Arcady. Nevertheless it is Greenland that has the people. Why do they shun Arcady? To the traveler from the highlands the fertile valleys between 5,000 and 8,000 feet seem like the abode of friendly spirits to whose charm the highland dweller must yield. Every pack-train from valley to highland carries luxury in the form of fruit, coca, cacao, and sugar. One would think that every importation of valley products would be followed by a wave of migration from highland to valley. On the contrary the highland people have clung to their lofty pastures for unnumbered centuries. Until the Conquest the last outposts of the Incas toward the east were the grassy ridges that terminate a few thousand feet below the timber line.

In this natural grouping of the people where does choice or blind prejudice or instinct leave off? Where does necessity begin? There are answers to most of these questions to be found in the broad field of geographic comparison. But before we begin comparisons we must study the individual facts upon which they rest. These facts are of almost every conceivable variety. They range in importance from a humble shepherd's stone corral on a mountain slope to a thickly settled mountain basin. Their interpretation is to be sought now in the soil of rich playa lands, now in the fixed climatic zones and rugged relief of deeply dissected, lofty highlands in the tropics. Some of the controlling factors are historical, others economic; still other factors have exerted their influence through obscure psychologic channels almost impossible to trace. The *why* of man's distribution over the earth is one of the most complicated problems in natural science, and the solution of it is the chief problem of the modern geographer.

At first sight the mountain people of the Peruvian Andes seem to be uniform in character and in mode of life. The traveler's first impression is that the same stone-walled, straw-thatched type of hut is to be found everywhere, the same semi-nomadic life, the same degrees of poverty and filth. Yet after a little study the diversity of their lives is seen to be, if not a dominating fact, at least one of surprising importance. Side by side

*A chapter from a book entitled "The Andes of Southern Peru" to be published by the American Geographical Society in 1916. Part of the work of the Yale Peruvian Expedition of 1911.

FIG. 1—This stone hut, grass-thatched, is the highest permanent habitation in Peru, and it is believed to be the highest in the world. Altitude of 17,100 feet determined by instrumental survey. The topographic map showing details of the region is to be published in the final report. For location, see Fig. 2.

with this diversity there runs a corresponding diversity of relations to their physical environment. Nowhere else on the earth are greater physical contrasts compressed within such small spaces. If, therefore, we accept the fundamental theory of geography that there is a general, necessary, varied, and complex relation between man and the earth, that theory ought here to find a really vast number of illustrations. A glance at the accompanying figures discloses the wide range of relief in the Peruvian Andes. The corresponding range in climate and in life therefore furnishes an ample field for the application of the laws of human distribution.

In analyzing the facts of distribution we shall do well to begin with the causes and effects of migration. Primitive man is in no small degree a wanderer. His small resources often require him to explore large tracts. As population increases the food quest becomes more intense, and thus there come about repeated emigrations which increase the food supply, extend its variety, and draw the pioneers at last into contact with neighboring groups. The farther back we go in the history of the race the clearer it becomes that migrations lie at the root of much of human development. The raid for plunder, women, food, beasts, is a persistent feature of the life of those primitive men who live on the border of unlike regions.

The shepherd of the highland and the forest hunter of the plains perforce range over vast tracts, and each brings back to the home group news that confirms the tribal choice of habitation or sets it in motion toward a more desirable place. Superstitions may lead to flight akin to migration. Epidemics may be interpreted as the work of a malignant spirit from which men must flee. War may drive a defeated group into the fastnesses of a mountain forest where pursuit by stream or trail weakens the pursuer and confines his action, thereby limiting his power. Floods may come and destroy the cultivated spots. Want or mere desire in a hundred forms may lead to movement.

Even among forest tribes long stationary the facile canoe and the light household necessities may easily enable trivial causes to develop the spirit of restlessness. Pressure of population is a powerful but not a general cause of movement. It may affect the settled groups of the desert oases, or the dense population of fertile plains that are rooted in the soil. On the other hand mere whims may start a nomadic group toward a new goal. Often the goal is elusive and the tribe turns back to the old haunts or perishes in the shock of unexpected conflict.

In the case of both primitive societies and those of a higher order the causes and the results of migration are often contradictory. These will depend on the state of civilization and the extremes of circumstance. When the desert blooms the farmers of the Piura Valley in northwestern Peru turn shepherd and drive their flocks of sheep and goats out into the short-lived pastures of the great pampa on the west. In dry years they send them eastward into the mountains. The forest Indian of the lower Uru-

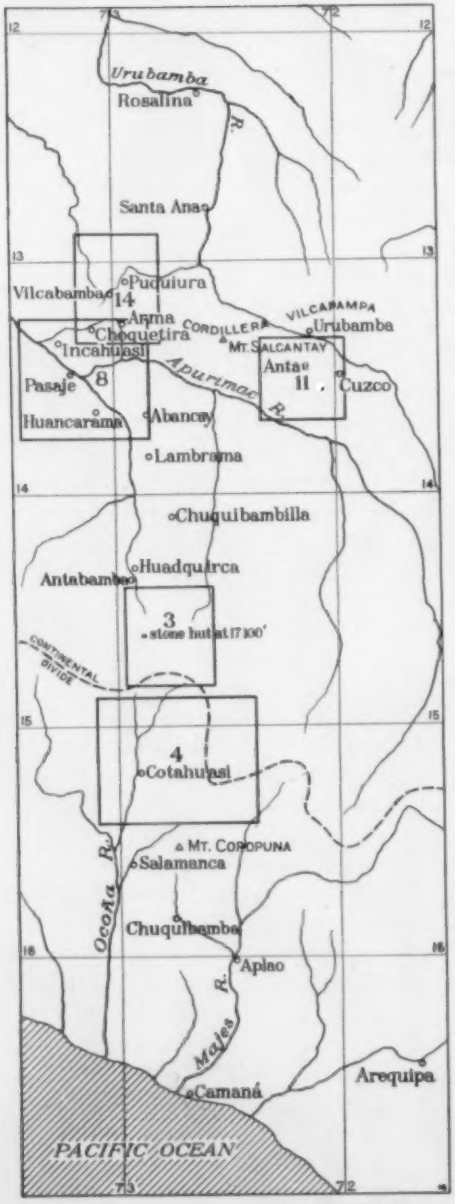

FIG. 2—Outline map of a part of the Andes of southern Peru showing the location of the regional diagrams and of the names mentioned in the text. Scale, 1:3,300,000. The large numbers in the rectangles correspond with the figure numbers.

bamba is a fisherman while the river is low and lives in a reed hut beside his cultivated patch of cane and yuca. When the floods come he is driven to the higher ground in the hills where he has another cultivated patch of land and a rude shelter. To be sure, these are seasonal migrations, yet through them the country becomes better known to each new generation of men. And each generation supplies its pioneers, who drift into the remoter places where population is scarce or wanting altogether.

Dry years and extremely dry years may have opposite effects. When moderate dryness prevails the results may be endurable. The oases become crowded with men and beasts just when they can ill afford to support them. The alfalfa meadows become overstocked, and cattle become lean and almost worthless. But there is at least bare subsistance. By contrast, if extreme and prolonged drought prevails, some of the people are driven forth to more favored spots. At Vallenar in central Chile, some of the workmen in extreme years go up to the nitrate pampa; in wet years they return. When the agents of the nitrate companies hear of hard times in a desert valley they offer employment to the stricken people. It not infrequently happens that when there are droughts in desert Chile there are abundant rains in Argentina on the other side of the Cordillera. There has

therefore been for many generations an irregular and slight, though definite, shifting of population from one side of the mountains to the other as periods of drought and periods of rain alternated in the two regions. Some think there is satisfactory evidence to prove that a number of the great Mongolian emigrations took place in wet years when pasture was abundant and when the pastoral nomad found it easy to travel. On the other hand it has been urged that the cause of many emigrations was prolonged periods of drought when the choice lay between starvation and flight. It is evident from the foregoing that both views may be correct in spite of the fact that identical effects are attributed to opposite causes.

It is still an open question whether security or insecurity is more favorable for the broad distribution of the Peruvian Indians of the mountain zone which form the subject of this paper. Certainly both tend to make the remoter places better known. Tradition has it that, in the days of intertribal conflict before the Conquest, fugitives fled into the high mountain pastures and lived in hidden places and in caves. Life was insecure and relief was sought in flight. On the other hand peace has brought security to life. The trails are now safe. A shepherd may drive his flock anywhere. He no longer has any one to fear in his search for new pastures. It would perhaps be safe to conclude that there is equally broad distribution of men in the mountain pastures in time of peace and in time of war. There is, however, a difference in the kind of distribution. In time of peace the individual is safe anywhere; in time of unrest he is safe only when isolated and virtually concealed. By contrast, the group living near the trails is scattered by plundering bands and war parties. The remote and isolated group may successfully oppose the smaller band and the individuals that might reach the remoter regions. The fugitive group would have nothing to fear from large bands, for the limited food supply would inevitably cause these to disintegrate upon leaving the main routes of travel. Probably the fullest exploration of the mountain pastures has resulted from the alternation of peace and war. The opposite conditions which these establish foster both kinds of distribution; hence both the remote group life encouraged by war and the individual's lack of restraint in time of peace are probably in large part responsible for the present widespread occupation of the Peruvian mountains.

The loftiest habitation in the world (Fig. 1) is in Peru. Between Antabamba and Cotahuasi occur the highest passes in the Maritime Cordillera. We crossed at 17,400 feet, and three hundred feet lower is the last outpost of the Indian shepherds. The snowline, very steeply canted away from the sun, is between 17,200 and 17,600 feet. At frequent intervals during the three months of winter, snowfalls during the night and terrific hailstorms in the late afternoon drive both shepherds and flocks to the shelter of leeward slopes or steep canyon walls. At our six camps, between 16,000 and 17,200 feet in September, 1911, the minimum temperature

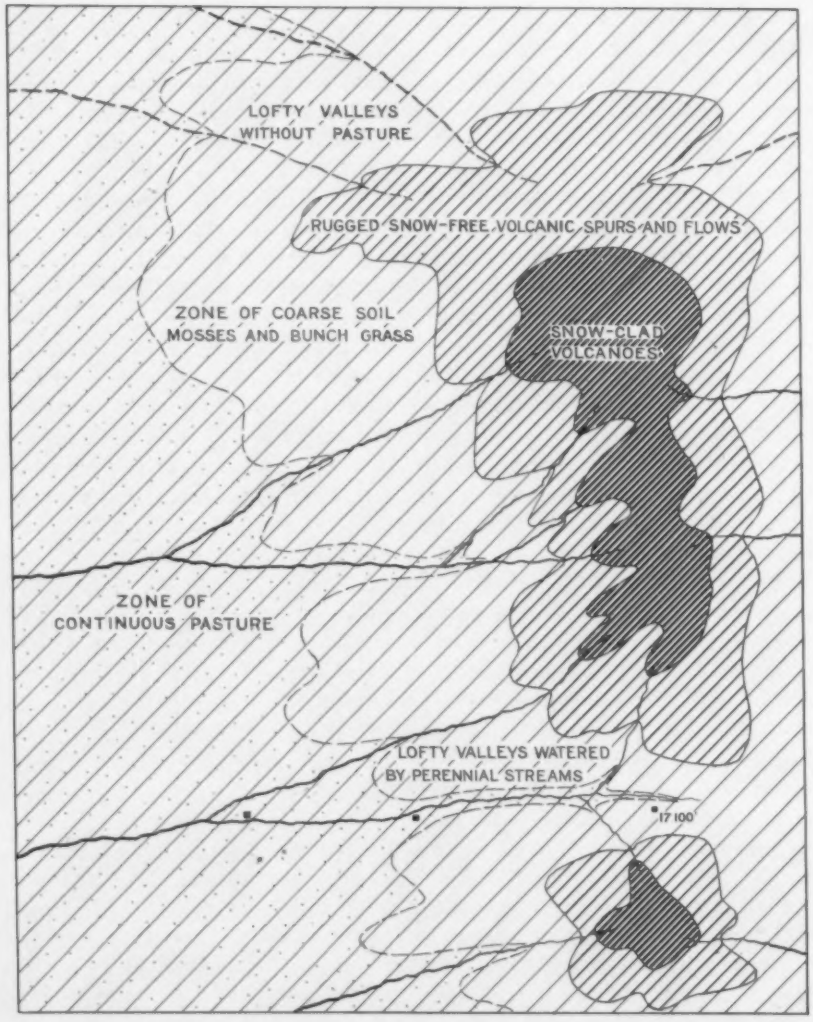

FIG. 3—Regional diagram for the Maritime Cordillera to show the physical relations in the district where the highest habitations in the world are located. For location, see Fig. 2. It should be remembered that the orientation of these diagrams is generalized. By reference to Fig. 2 it will be seen that some portions of the crest of the Maritime Cordillera run east and west and others north and south. The same is true of the Cordillera Vilcapampa, Fig. 14.

Note on regional diagrams.—For the sake of clearness I have classified the accompanying facts of human distribution in the country of the shepherds and represented them graphically in "regional" diagrams, Figs. 3, 4, 8, 11, and 14. Because they are presented here for the first time a word of explanation is desirable. They are constructed on the principle of dominant control. Each brings out the factors of greatest importance in the distribution of the people in a given region. Furthermore, the facts are compressed within the limits of a small rectangle. This compression, though great, respects all essential relations. For example, every location on these diagrams has a concrete illustration but the accidental relations of the field have been omitted; the essential relations are preserved. Each diagram is, there-

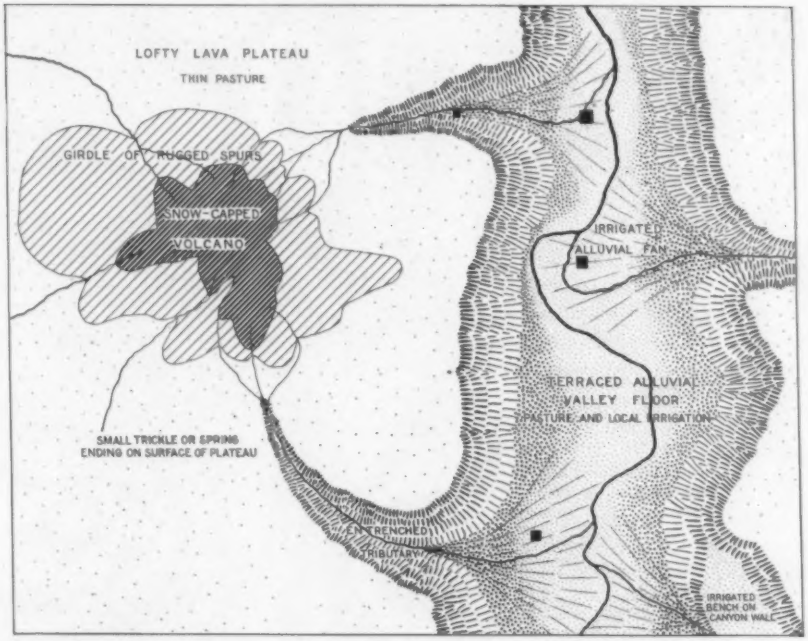
LOFTY LAVA PLATEAU
THIN PASTURE
GIRDLE OF RUGGED SPURS
SNOW-CAPPED VOLCANO
IRRIGATED ALLUVIAL FAN
TERRACED ALLUVIAL VALLEY FLOOR PASTURE AND LOCAL IRRIGATION
SMALL TRICKLE OR SPRING ENDING ON SURFACE OF PLATEAU
ENTRENCHED TRIBUTARY
IRRIGATED BENCH ON CANYON WALL

FIG. 4—Regional diagram to show the physical relations in the lava plateau of the Maritime Cordillera west of the continental divide. For location, see Fig. 2. Trails lead up the entrenched tributaries. If the irrigated bench (lower right corner) is large, a town will be located on it. Shepherds' huts are scattered about the edge of the girdle of spurs. There is also a string of huts in the deep sheltered head of each tributary. See also Fig. 5 for conditions on the valley or canyon floor.

ranged from 4° to 20° F. The thatched stone hut that we passed at 17,100 feet and that enjoys the distinction of being the highest in the world was in other respects the same as the thousands of others in the same region.

fore, a kind of generalized type map. It bears somewhat the same relation to the facts of human geography that a block diagram does to physiography. The darkest shading represents steep snow-covered country; the next lower grade represents rough but snow-free country; the lightest shading represents moderate relief; and no shading represents plain or plateau. Small circles represent forest or woodland; small open-spaced dots, grassland. Fine alluvium is represented by small closely spaced dots; coarse alluvium by large closely spaced dots.

To take an illustration. In Figure 8 we have the Apurimac region near Pasaje (see location map, Fig. 2). At the lower edge of the rectangle is a snow-capped outlier of the Cordillera Vilcapampa. The belt of rugged country represents the lofty, steep, exposed, and largely inaccessible ridges at the mid-elevations of the mountains below the glaciated slopes at the heads of tributary valleys. The villages in the belt of pasture might well be Incahuasi and Patapampa. The floors of the large canyons on either hand are bordered by extensive alluvial fans. The river courses are sketched in a diagrammatic way only, but a map would not be different in its general disposition. Each location is justified by a real place with the same essential features and relations. In making the change there has been no alteration of the general relation of the alluvial lands to each other or to the highland. By suppressing unnecessary details there is produced a diagram whose essentials have simple and clear relations. When such a regional diagram is amplified, as in this article, by photographs of real conditions it becomes a sort of generalized picture of a large group of geographic facts. One could very well extend the method to the whole of South America. It would be a real service to geography to draw up a set of, say, twelve to fifteen regional diagrams, still further generalized, for the whole of the continent. As a broad classification they would serve both the specialist and the general student. As the basis for a regional map of South America they would be invaluable if worked out in sufficient detail and constructed on the indispensable basis of field studies.

It sheltered a family of five. As we passed, three rosy-cheeked children almost as fat as the sheep about them were sitting on the ground in a corner of the corral playing with balls of wool. Hundreds of alpacas and sheep grazed on the hill slopes and valley floor, and their tracks showed plainly that they were frequently driven up to the snowline in those valleys where a trickle of water supported a band of pasture. Less than a hundred feet below them were other huts and flocks.

Here we have the limits of altitude and the limits of resources. The intervalley spaces do not support grass. Some of them are quite bare, others are covered with mosses. It is too high for even the tola bush—that pioneer of Alpine vegetation in the Andes. The distance[1] to Cotahuasi is 75 miles, to Antabamba 50 miles. Thence wool must be shipped by mule-back to the railroad in the one case 250 miles to Arequipa, in the other case 200 miles to Cuzco. Even the potatoes and barley, which must be imported, come from valleys several days' journey away. The question naturally arises why these people live on the rim of the world. Did they seek out these neglected pastures, or were they driven to them? Do they live here by choice or of necessity? The answer to these questions introduces two other geographic factors, the one physical, the other commercial, which we shall now examine.

The main tracts of lofty pasture above Antabamba cover mountain slopes and valley floor alike, but the moist valley floors supply the best grazing (Fig. 3). Moreover, the main valleys have been intensively glaciated. Hence, though their sides are steep walls, their floors are broad and flat. Marshy tracts, periodically flooded, are scattered throughout, and here and there are overdeepened portions where lakes have gathered. There is a thick carpet of grass, also numerous huts and corrals, and many flocks. At the upper edge of the main zone of pasture the grasses become thin and with increasing altitude give out altogether except along the moist valley floors or on shoulders where there is seepage.

If the streams head in dry mountain slopes without snow the grassy bands of the valley floor terminate at moderate elevations. If the streams have their sources in snowfields or glaciers there is a more uniform run-off, and a ribbon of pasture may extend to the snowline. To the latter class belong the pastures that support these remote people.

In the case of the Maritime Andes the great elevation of the snowline is also a factor. If, in Figure 3, we think of the snowline as at the upper level of the main zone of pasture then we would have the conditions shown in Figure 14, where the limit of general, not local occupation is the snowline, as in the Cordillera Vilcapampa and between Chuquibambilla and Antabamba.

A third factor is the character of the soil. Large amounts of volcanic ash and lapilli were thrown out in the late stages of volcanic eruption in

[1] Distances are not taken from the map but from the trail.

FIG. 5—Cotahuasi on the floor of the Cotahuasi canyon. The even skyline of the background is on a rather even-topped lava plateau. The terrace on the left of the town is formed on limestone, which is overlaid by lava flows. A thick deposit of terraced alluvium may be seen on the valley floor, and it is on one of the lower terraces that the city of Cotahuasi stands. The higher terraces are in many cases too dry for cultivation. The canyon is nearly 7,000 feet deep and has been cut through over one hundred principal lava flows.

which the present cones of the Maritime Andes were formed. The coarse texture of these deposits allows the ready escape of rainwater. The combination of extreme aridity and great elevation results in a double restraint upon vegetation. Outside of the moist valley floors, with their film of ground moraine on whose surface plants find a more congenial soil, there is an extremely small amount of pasture. Here are the natural grazing grounds of the fleet vicuña. They occur in hundreds, and so remote and little disturbed are they that near the main pass one may count them by the score. As we rode by, many of them only stared at us without taking the trouble to get beyond rifle shot. It is not difficult to believe that the Indians easily shoot great numbers in remote valleys that have not been hunted for years.

The extreme conditions of life existing on these lofty plateaus is well shown by the readiness with which even the hardy shepherds avail themselves of shelter. Wherever deep valleys bring a milder climate within reach of the pastures the latter are unpopulated for miles on either side. The sixty-mile stretch between Chuquibamba and Salamanca is without even a single hut, though there are pastures superior to the ones occupied by those loftiest huts of all. Likewise there are no permanent homes between Salamanca and Cotahuasi, though the shepherds migrate across this belt in the milder season of rain. Eastward and northward toward the crest of the Maritime Cordillera there are no huts within a day's journey of the Cotahuasi canyon. Then there is a group of a dozen just under the crest of the secondary range that parallels the main chain of volcanoes. Thence northward there are a number of scattered huts between 15,500 and 16,500 feet, until we reach the highest habitations of all at 17,100 feet.

The unpopulated belts of lava plateau bordering the entrenched valleys are, however, as distinctly "sustenance" spaces, to use Penck's term, as the irrigated and fertile alluvial fans in the bottom of the valley. This is well shown when the rains come and flocks of llamas and sheep are driven forth from the valleys to the best pastures. It is equally well shown by the distribution of the shepherds' homes. These are not down on the warm canyon floor, separated by a half day's journey from the grazing. They are in the entrenched tributary valleys of Figure 4 or just within the rim of the canyon. It is not shelter from the cold but from the wind that chiefly determines their location. They are also kept near the rim of the canyon by the pressure of the farming population from below. Every hundred feet of descent from the arid plateau (Fig. 5) increases the water supply. Springs increase in number and size; likewise belts of seepage make their appearance. The gradients in many places diminish, and flattish spurs and shoulders interrupt the generally steep descents of the canyon wall. Every change of this sort has a real value to the farmer and means an enhanced price beyond the ability of the poor shepherd to pay. If you ask a wealthy *hacendado* on the valley floor (Figs. 5 and 6), who it is that live in the huts

above him, he will invariably say "los Indios," with a shrug meant to convey the idea of poverty and worthlessness. Sometimes it is "los Indios pobres," or merely "los pobres." Thus there is a vertical stratification of society corresponding to the superimposed strata of climate and land.

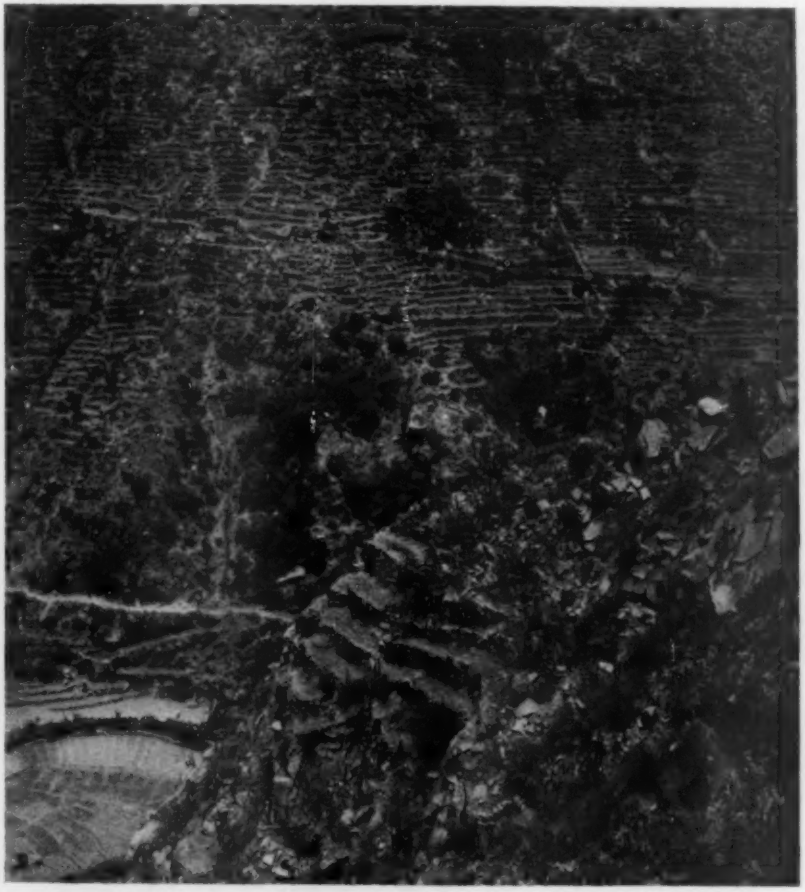

FIG. 6—Terraced hill slopes near Salamanca. There is no part of the photograph which is not covered with terraces save a few places where bushy growths are visible or where torrents descend through artificial canals.

At Salamanca (Fig. 7) I saw this admirably displayed under circumstances of unusual interest. The floor and slopes of the valley are more completely terraced than in any other valley I know of. In the photograph, Figure 6, which shows at least 2,500 feet of descent near the town, one cannot find a single patch of surface that is not under cultivation. The valley is simply filled with people to the limit of its capacity. Practically all are

FIG. 7—Salamanca, on the floor of the deep Arma valley, which is really a canyon above this point and which, in spite of its steepness, is thoroughly terraced and intensively cultivated up to the frost line. See also Fig. 6.

Indians, but with many grades of wealth and importance. When we rode out of the valley before daybreak, one September morning in 1911, there was a dead calm, and each step upward carried us into a colder stratum of air. At sunrise we had reached a point about 2,000 feet above the town, or 14,500 feet above sea level. We stood on the frost line. On the opposite wall of the valley the line was as clearly marked out as if it had been an irrigating canal. The light was so fully reflected from the millions of frost crystals above it that both the mountainside and the valley slopes were sparkling like a ruffled lake at sunrise. Below the frost line the slopes were dark or covered with yellow barley and wheat stubble or green alfalfa.

It happened that the frost line was near the line of division between corn and potato cultivation and also near the line separating the steep rough upper lands from the cultivable lower lands. Not a habitation was in sight above us, except a few scattered miserable huts near broken terraces, gullied by wet-weather streams and grown up to weeds and brush. Below us were well-cultivated fields, and the stock was kept in bounds by stone fences and corrals; above, the half-wild burros and mules roamed about everywhere, and only the sheep and llamas were in rude enclosures. Thus in a half hour we passed the frontier between the agricultural folk below the frost line and the shepherd folk above it.

In a few spots the line followed an irregular course, as where flatter lands were developed at unusual elevations or where air drainage altered the normal temperature. And at one place the frost actually stood on the young corn, which led us to speculate on the possibility of securing from Salamanca a variety of maize that is more nearly resistant to light frosts than any now grown in the United States. In the endless and largely unconscious experimentation of these folk perched on the valley walls a result may have been achieved ahead of that yet reached by our professional experimenters. Certain it is that nowhere else in the world has the potato been grown under such severe climatic conditions as in its native land of Peru and Bolivia. The hardiest varieties lack many qualities that we prize. They are small and bitter. But at least they will grow where all except very few cultivated plants fail, and they are edible. Could they not be imported into Canada to push still farther northward the limits of cultivation? Potatoes are now grown at Forts Good Hope and McPherson in the lower Mackenzie basin. Would not the hardiest Peruvian varieties grow at least as far north as the continental timber line? I believe they could be grown still farther north. They will endure repeated frosts. They need scarcely any cultivation. Prepared in the Peruvian manner, as *chuña*, they could be kept all winter. Being light, the meal derived from them could be easily packed by hunters and prospectors. An Indian will carry in a pouch enough to last him a week. Why not use it north of the continental limit of other cultivated plants since it is the pioneer above the frost line on the Peruvian mountains?

The relation between farmer and shepherd or herdsman grows more complex where deeper valleys interrupt the highlands and mountains. Figure 8 represents typical relations, though based chiefly on the Apurimac

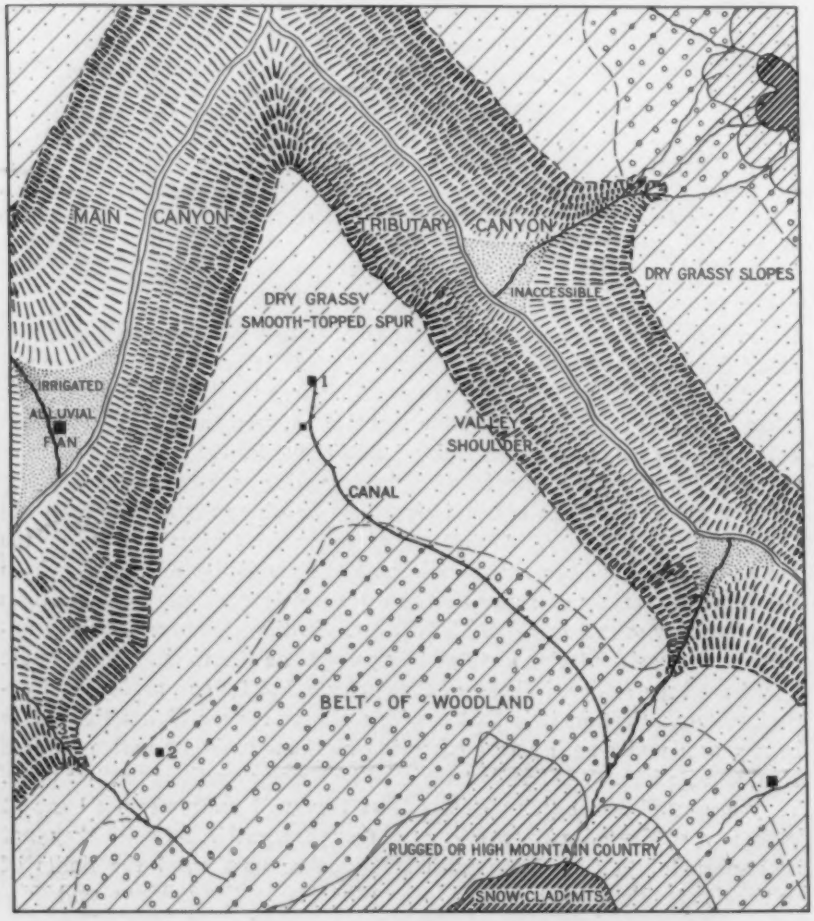

FIG. 8—Regional diagram representing the deep canyoned country west of the Eastern Cordillera in the region of the Apurimac. For photograph see Fig. 10. For further description see footnote to Fig. 3. Numbers 1, 2, and 3 correspond in position to the same numbers in Fig. 9.

canyon and its surroundings near Pasaje. First there is the snow-clad region at the top of the country. Below it are grassy slopes, the homes of mountain shepherds, or rugged mountain country unsuited for grazing. Still lower there is woodland, in patches chiefly, but with a few large continuous tracts. The shady sides of the ravines and the mountains have the

most moisture, hence bear the densest growths. Finally, the high country terminates in a second belt of pasture below the woodland.

Wherever streams descend from the snow or woodland country there is water for the stock above and for irrigation on the alluvial fan below. But

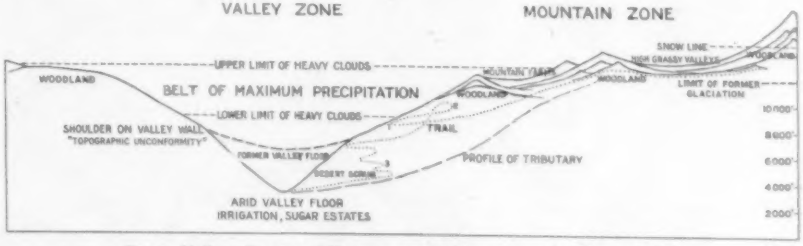

FIG. 9—Valley climates of the canyoned region shown in Figs. 8 and 10.

FIG. 10—The Apurimac canyon near Incahuasi above Pasaje. See Figs. 2 and 8. The moderate slope in the immediate foreground is repeated (a) on the summit of the dark spur on the left, (b) on the spur that interlocks with it in the center, and (c) just under the clouds on the extreme left. In contrast are the precipitous inner walls of the canyon. It is 8,000 feet from the clouds to the canyon floor.

the spur ends dropping off abruptly several thousand feet have a limited area and no running streams, and the ground water is hundreds of feet down. There is grass for stock, but there is no water. In some places the stock is driven back and forth every few days. In a few places water is brought to the stock by canal from the woodland streams above, as at Incahuasi (Figs. 2 and 8). In the same way a canal brings water to Pasaje

hacienda from a woodland strip many miles to the west. The little canal in the figure is almost a toy construction a few inches wide and deep and con-

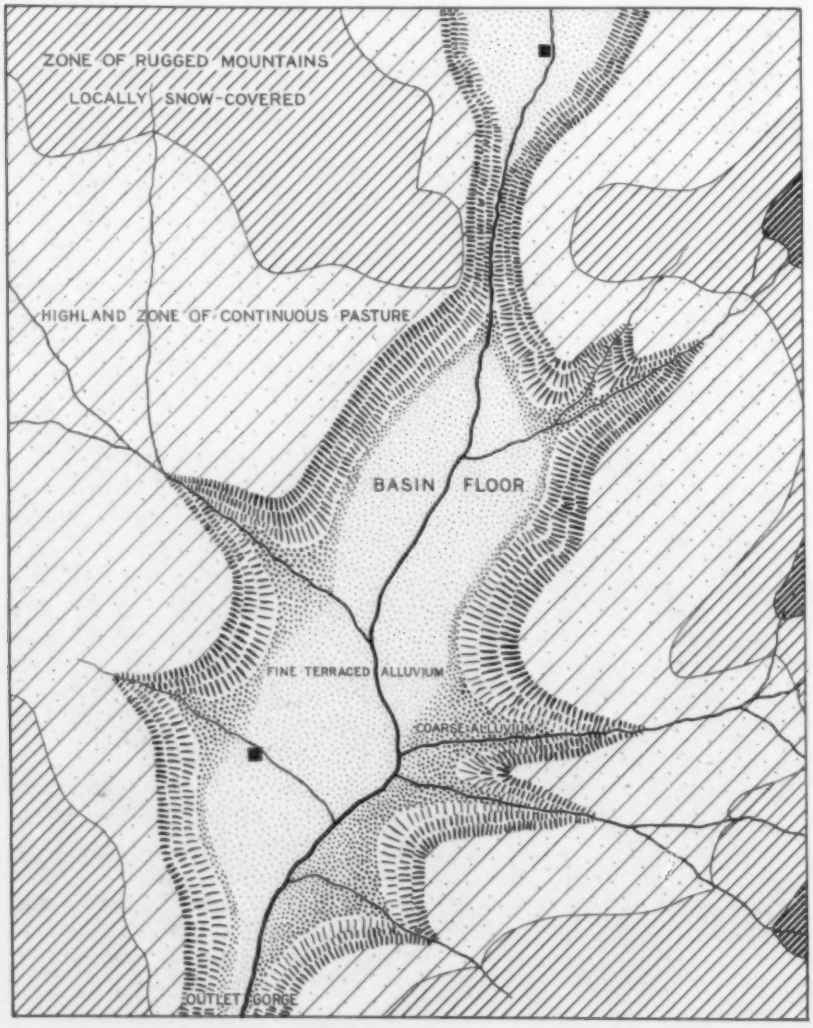

FIG. 11—Regional diagram to show the typical physical conditions and relations in an intermont basin in the Peruvian Andes. See also Fig. 13. In addition to reference to the note under Fig. 3 it should be emphasized that this is not a "map" of the Cuzco basin. While the conditions in that basin are the chief basis of the diagram, the generalization has been extended to illustrate many basins.

veying only a trickle of water. Yet on it depends the settlement at the spur end, and if it were cut the people would have immediately to repair it or establish new homes.

The canal and the pasture are possible because the slopes are moderate. They were formed in an earlier cycle of erosion when the land was lower. They are hung midway between the rough mountain slopes above and the steep canyon walls below (Fig. 10). Their smooth descents and gentle pro-

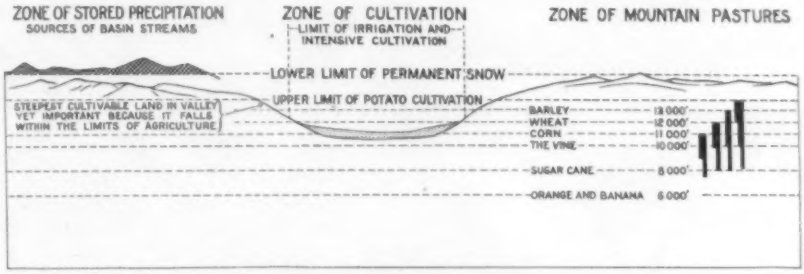
ZONE OF STORED PRECIPITATION
SOURCES OF BASIN STREAMS
ZONE OF CULTIVATION
LIMIT OF IRRIGATION AND INTENSIVE CULTIVATION
ZONE OF MOUNTAIN PASTURES
LOWER LIMIT OF PERMANENT SNOW
UPPER LIMIT OF POTATO CULTIVATION
STEEPEST CULTIVABLE LAND IN VALLEY YET IMPORTANT BECAUSE IT FALLS WITHIN THE LIMITS OF AGRICULTURE
BARLEY 13 000'
WHEAT 12 000'
CORN 11 000'
THE VINE 10 000'
SUGAR CANE 8 000'
ORANGE AND BANANA 6 000'

FIG. 12—Climatic cross-section showing the location of various zones of cultivation and pasture in a typical intermont basin in the Peruvian Andes. The thickness of the dark symbols on the right is proportional to the amount of each staple that is produced at the corresponding elevation.

FIG. 13—Composition of topography on the edge of an intermont basin (Cuzco). The crest of the hills is the edge of a plateau devoted to grazing. Farms and pastures are developed on the lower levels of the hillslopes in the picture. There is a border zone of coarse gravels or benchland of older strata. In the foreground is younger alluvium which forms the highly cultivated floor of the valley. See also Fig. 11.

files are in very pleasing contrast to the rugged scenery about them. The trails follow them easily. Where the slopes are flattest, farmers have settled and produce good crops of corn, vegetables, and barley. Some farmers have even developed three- and four-story farms. On an alluvial fan in the

main valley they raise sugar cane and tropical and subtropical fruits; on the flat upper slopes they produce corn; in the moister soil near the edge of the woodland are fields of mountain potatoes; and the upper pastures main-

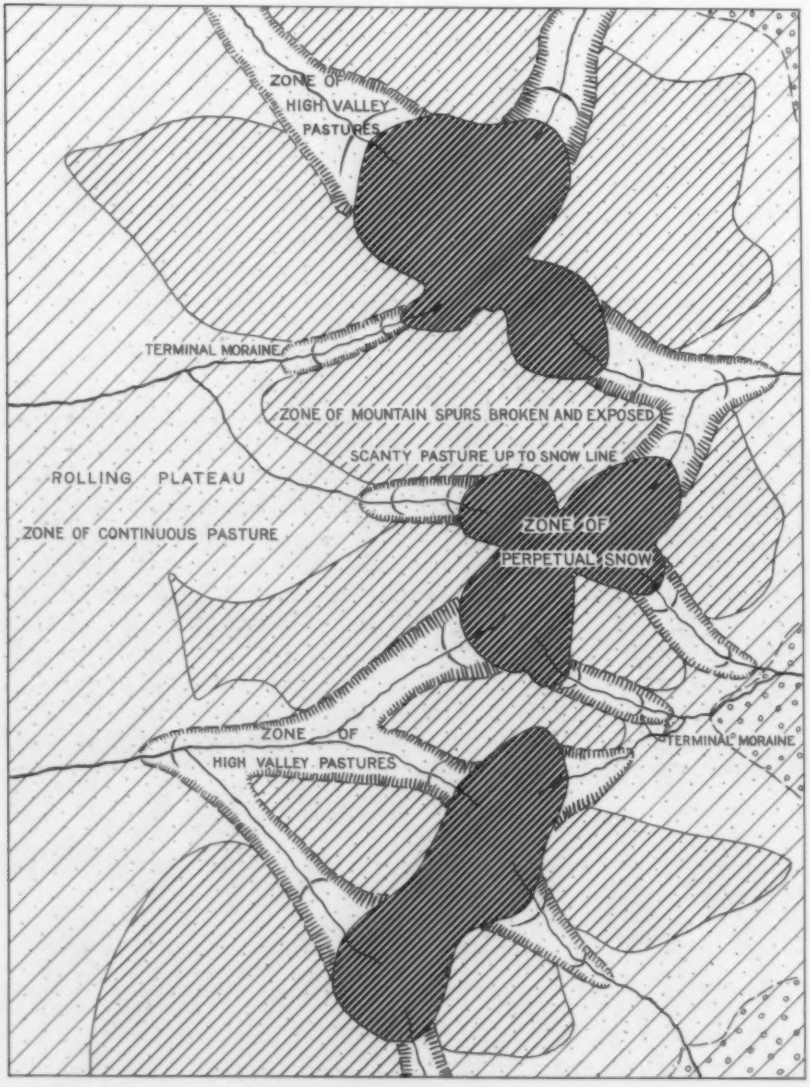

FIG. 14—Regional diagram for the Eastern Cordillera or Cordillera Vilcapampa. Note the crowded zones on the right (east and north) in contrast to the open succession on the left. In sheltered places woodland extends even higher than shown. At several points patches of it grow right under the snowline. Other patches grow on the floors of the glaciated valley troughs.

tain flocks of sheep. In one district this change takes place in a distance that may be covered in five hours. Generally it is at least a full and hard day's journey from one end of the series to the other.

Wherever these features are closely associated they tend to be controlled by the planter in some deep valley thereabouts. Where they are widely scattered the people are independent, small groups living in places nearly inaccessible. Legally they are all under the control of the owners of princely tracts that take in the whole country, but the remote groups are left almost wholly to themselves. In most cases they are supposed to sell their few commercial products to the *hacendado* who nominally owns their

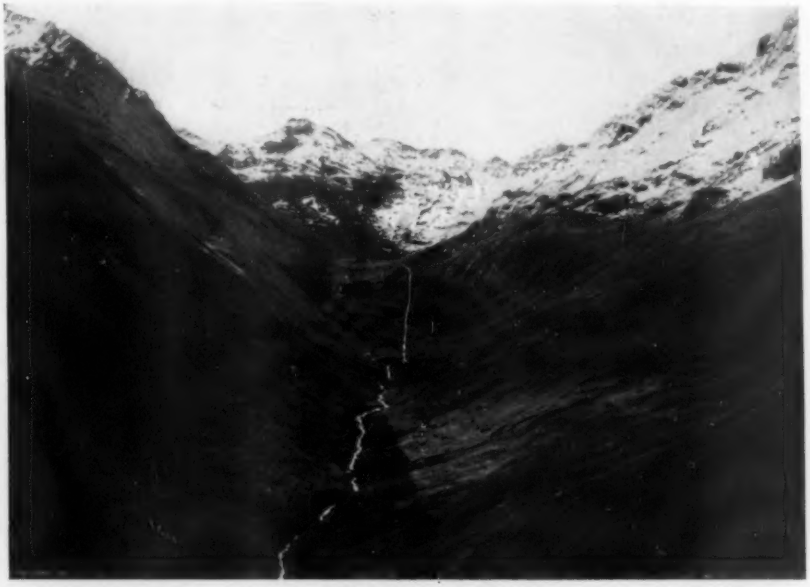

FIG. 15—Looking up a spurless flat-floored glacial trough near the pass in the Cordillera Vilcapampa from 14,200 feet. Note the looped terminal and lateral moraines on the steep valley wall on the left. A stone fence from wall to wall serves to enclose the flock of the mountain shepherd.

land, but the administration of this arrangement is left largely to chance. The shepherds and small farmers near the plantation are more dependent upon the planter for supplies, and also their wants are more varied and numerous. Hence they pay for their better location in free labor and in produce sold at a discount.

So deep are some of the main canyons, like the Apurimac and the Cotahuasi, that their floors are arid or semi-arid. The fortunes of Pasaje are tied to a narrow canal from the moist woodland and a tiny brook from a hollow in the valley wall. Where the water has thus been brought down to the arable soil of the fans there are rich plantations and farms. Elsewhere, however, the floor is quite dry and uncultivated. In small spots

here and there is a little seepage, or a few springs, or a mere thread of water that will not support a plantation, wherefore there have come into existence the valley herdsmen and shepherds. Their intimate knowledge of the moist places is their capital, quite as much as the cattle and sheep they own. In a sense their lands are the neglected crumbs from the rich man's table. So we find the shepherd from the hills invading the valleys just as the valley farmer has invaded the country of the shepherd.

The basin type of topography calls into existence a set of relations quite distinct from either of those we have just described. Figure 11 represents the main facts. The rich and comparatively flat floor of the basin supports most of the people. The alluvial fans tributary thereto are composed of fine material on their outer margin and of coarse stony waste at their heads. Hence the valley farms also extend over the edges of the fans, while only pasture or dense chaparral occupies the upper portions. Finally there is the steep margin of the basin where the broad and moderate slopes of the highland break down to the floor of the basin.

If a given basin lies at an elevation exceeding 14,000 feet, there will be no cultivation, only pasture. If at 10,000 or 11,000 feet, there will be grain fields below and potato fields above (Figs. 12 and 13). If still lower, fruit will come in and finally sugar cane and many other subtropical products, as at Abancay. Much will also depend upon the amount of available water and the extent of the pasture land all about. Thus the densely populated Cuzco basin has a vast mountain territory tributary to it and is itself within the limits of barley and wheat cultivation. Furthermore there are a number of smaller basins, like the Anta basin on the north, which are dependent upon its better markets and transportation facilities. A dominance of this kind is self-stimulating and at last is out of all proportion to the original differences of nature. Cuzco has also profited as the gateway to the great northeastern valley region of the Urubamba and its big tributaries. All of the varied products of the subtropical valleys find their immediate market at Cuzco.

The effect of this natural conspiracy of conditions has been to place the historic city of Cuzco in a position of extraordinary importance. Hundreds of years before the Spanish Conquest it was a center of far-reaching influence, the home of the powerful Inca kings. From it the strong arm of authority and conquest was extended; to it came tribute of grain, wool, and gold. To one accustomed to look at such great consequences as having at least some ultimate connection with the earth, the situation of Cuzco would be expected to have some unique features. With the glorious past of that city in mind, no one can climb to the surrounding heights and look down upon the fertile mountain-rimmed plain as at an ordinary sight. The secret of those great conquests lies not only in mind but in matter. If the rise of the Incas to power was not related to the topography and climate of the Cuzco basin, at least it is certain that without so broad and noble a stage the scenes would have been enacted on a far different scale.

The first Inca king and the Spanish after the Incas found here no mobile nomadic tribes melting away at the first touch, no savages hiding in forest fastnesses, but a well-rooted agricultural race in whose center a large city had grown up. Without a city and a fertile tributary plain no strong system of government could be maintained or could even arise. It is a great advantage in ruling to have subjects that can not move. The

FIG. 16—Alpine pastures in the mountain valley, between Chuquibambilla and Lambrama. Huge stone corrals are built on either slope, sheltered from the night winds that blow down-valley.

agricultural Indians of the Andean valleys and basins, in contrast to the mobile shepherd, are as fixed as the soil from which they draw their life.

The full occupation of the pasture lands about the Cuzco basin is in direct relation to the advantages we have already enumerated. Every part of the region feels the pressure of population. Nowhere else in the Peruvian Andes are the limits between cultivation and grazing more definitely drawn than here. Moreover, there is today a marked difference between the types that inhabit highland and basin. The basin Indian is either a debauched city dweller or, as generally, a relatively alert farmer.

The shepherds are exceedingly ignorant and live for the most part in a manner almost as primitive as at the time of the Conquest. They are shy and suspicious. Many of them prefer a life of isolation and rarely go down to the town. They live on the fringe of culture. The new elements of their life have come to them solely by accident and by what might be called an ethnic process of seepage. The slight advances that have been made do not happen by design, they merely happen. Put the highland shepherd in the basin and he would starve in competition with the basin type. Undoubtedly he would live in the basin if he could. He has not been driven out of the basin; he is kept out.

And thus it is around the border of the Abancay basin and others like it. Only, the Abancay basin is lower and more varied as to resources. The Indian is here in competition with the capitalistic white planter. He lives on the land by sufferance alone. Farther up the slopes are the farms of the Indians and above them are the pastures of the ignorant shepherds. Whereas the Indian farmer who raises potatoes clings chiefly to the edge of the Cuzco basin where lie the most undesirable agricultural lands, the Indian farmers of Abancay live on broad rolling slopes like those near the pass northward toward Huancarama. They are unusually prosperous, with fields so well cultivated and fenced, so clean and productive, that they remind one somewhat of the beautiful rolling prairies of Iowa.

It remains to consider the special topographic features of the mountain environments we are discussing, in the Vilcapampa region on the eastern border of the Andes (Fig. 14). The Cordillera Vilcapampa is snow-crested, containing a number of fine white peaks like Salcantay, Soray, and Soiroccocha (Fig. 2). There are a large number of small glaciers and a few that are several miles long. There was here in glacial times a much larger system of glaciers which lived long enough to work great changes in the topography. The floors of the glaciated valleys were smoothed and broadened and their gradients flattened (Fig. 15). The side walls were steepened and precipitous cirques were formed at the valley heads. Also, there were built across the valleys a number of stony morainic ridges. With all these changes there was, however, but little effect upon the main masses of the big intervalley spurs. They remain as before—bold, wind-swept, broken, and nearly inaccessible.

The work of the glaciers aids the mountain people. The stony moraines afford them handy sizable building material for their stone huts and their numerous corrals. The thick tufts of grass in the marshy spots in the overdeepened parts of the valleys furnish them with grass for their thatched roofs. And, most important of all, the flat valley floors have the best pasture in the whole mountain region. There is plenty of water. There is seclusion, and, if a wall be built from one valley wall to another, an entire section of the valley may be enclosed, and with little labor. A village like Choquetira, located on a bench on the valley side, commands an extensive

FIG. 17.

FIG. 18.

FIG. 17—Shepherds' shelter hut near Chuquibambilla. Elevation just under 16,000 feet. Contrast with Fig. 16 and Fig. 5.

FIG. 18—Village at head of alluvial fan near Lambrama. This relation of town to alluvial fan is typical of a large part of the Peruvian Andes. Above are the mountain pastures; below are the better farms of the valley and basin planters. See Fig. 16 for the grazing country. Elevation 10,600 feet.

view up and down the valley—an important feature in a grazing village where the corrals can not always be built near the houses of the owners. Long, finger-like belts of highland-shepherd population have thus been extended into the mountain valleys. Sheep and llamas drift right up to the snowline (Figs. 15 and 16).

There is, however, a marked difference between the people on opposite sides of the Cordillera Vilcapampa. On the west the mountains are bordered by a broad highland devoted to grazing. On the east there is a narrower grazing belt leading abruptly down to tropical valleys. The eastern or leeward side is also the warmer and wetter side of the Cordillera. The snowline is several hundred feet lower on the east. The result is that patches of scrub and even a little woodland occur almost at the snowline in favored places. Mist and storms are more frequent. The grass is longer and fresher. Vegetation in general is more abundant. The people make less of wool than of cattle, horses, and mules. Vilcabamba pueblo is famous for its horses, wiry, long-haired little beasts, as hardy as Shetland ponies. We found cattle grazing only five hundred feet below the limit of perpetual snow. There are cultivated spots only a little farther down, and only a thousand feet below the snow are abandoned terraces. At the same elevation are twisted ghenigo trees, at least two hundred years old, as shown by their rings of growth. Thus the limits of agriculture are higher on the east; likewise the limits of cattle grazing that naturally goes with agriculture. Sheep would thrive, but llamas do better in drier country, and the shepherd must needs mix his flocks, for the wool which is his chief product requires transportation and only the cheap and acclimated llama is at the shepherd's disposal. From these facts it will be seen that the anthropogeographic contrasts between the eastern and western sides of the Cordillera Vilcapampa are as definite as the climatic and vegetal contrasts. This is especially well shown in the difference between dry Arma, deep-sunk in a glaciated valley west of the crest of the mountains, and wet Puquiura, a half-day's journey east of the crest. There is no group on the east at all comparable to the shepherds of Choquetira, either in the matter of thoroughgoing dependence upon grazing or in that of dependence upon glacial topography.

Topography is not always so intimately related to the life of the people as here. In our own country the distribution of available water is a far greater factor. The Peruvian Andes therefore occupy a distinctive place in geography, since, more nearly than in most mountains, their physical conditions have typical human relations that enable one clearly to distinguish the limits of control of each feature of climate or relief.

The emphasis has been kept upon topographic controls, though it has not always been possible or desirable to detach these from their intimate associations with the leading climatic factors of temperature and rainfall.

PLAINS, PLANES, AND PENEPLANES

By DOUGLAS WILSON JOHNSON

Among the landforms which geographers have occasion frequently to describe, none suffers more from the unsatisfactory condition of geographic terminology than do the various types of plains of deposition and plains of erosion. When we realize that the term "coastal plain" is used to denote two features of such dissimilar origin as an uplifted series of seabottom deposits and a rock-cut terrace produced by marine abrasion, and that no names have been consistently applied to almost-plane surfaces of marine and aeolian denudation, it must appear desirable to give some attention to the terminology of these all-important forms.

In addition to plains composed of comparatively undisturbed and therefore approximately horizontal stratified rocks, we must recognize (1) the perfectly plane surfaces of ultimate erosion and (2) the imperfect, "almost-plane" surfaces which characterize the penultimate stages of the several erosion cycles. Theoretically there may be three, or possibly four, planes of completed erosion, with a corresponding number of almost-plane surfaces of uncompleted erosion, due to the action of rivers, waves, winds, and possibly glaciers.

Davis has given the name "peneplain" to the almost-plane surface of uncompleted fluvial denudation. The other almost-plane surfaces remain unnamed, except that such terms as "plain of marine denudation," "plain of marine abrasion," and "plain of aeolian erosion" have been applied to erosion surfaces, usually without regard to whether they were really plane surfaces or only surfaces of moderate relief. An exception to the foregoing statement is perhaps to be found in Gulliver's valuable paper on "Shoreline Topography," where he seems to call the almost-plane surface of marine erosion a "submarine platform," although he makes it identical with "plain of marine denudation" and would therefore seem to have no name for a perfectly plane surface of marine denudation.[1] It does not seem advisable to apply the adjective "submarine" to a surface which is today far above sea level; so some other name should be sought for uplifted surfaces of marine erosion.

It is coming to be recognized that some of the so-called peneplains are more probably almost-plane surfaces of marine erosion, as was, indeed, the opinion of the earlier geologists. Barrell[2] has even questioned the subaerial origin of the New England uplands, supposedly a typical peneplain, and

[1] F. P. Gulliver: Shoreline Topography, *Proc. Amer. Acad. Arts and Sciences*, Vol. 34, 1899, pp. 176-177.

[2] Joseph Barrell: Piedmont Terraces of the Northern Appalachians and Their Mode of Origin, *Bull. Geol. Soc. Amer.*, Vol. 24, 1913, p. 690.

the one above which rises the mountain selected as the type "monadnock." Should his conclusions prove correct and apply to the portion of the supposed peneplain in southern New Hampshire, then not only would the upland cease to merit the term "peneplain," but Mt. Monadnock would no longer be a "monadnock," as that term is generally defined. We would have to change the definition of monadnock or invent a new name for the topographic feature of which it is an example.

It appears, therefore, that we need names for the different types of erosion surfaces, which theoretically may be produced, both in the penultimate and the ultimate stages of erosion; that we also need a name for the actually existing upland surfaces of erosion which are so abundant in different parts of the world but of whose origin we are not yet certain; and, finally, that we need a clearer distinction in the names themselves, between "plains" of erosion, "plains" of deposition, and "peneplains." The writer believes it is possible to meet all these needs without departing unduly from the path of conservatism; and to this end the following usage is suggested: (1) The level erosion surface produced in the ultimate stage of any cycle may be called a *plane*. (2) The undulating erosion surface of moderate relief produced in the penultimate stage of any cycle may be called a *peneplane*. (3) A low-relief region of horizontal rocks would, as now, be called a *plain*. We should then recognize planes of fluvial,[3] marine, aeolian, and glacial denudation; also fluvial peneplanes, marine peneplanes, aeolian peneplanes, and glacial peneplanes. A monadnock would be defined as an erosion remnant left standing above a peneplane of any origin, either because it is composed of more resistant rock or because it has been less exposed to the agents of erosion. Vogt[4] has already used the term "Monadnock-Berge" for isolated hills on the uplifted marine abrasion plane of northern Norway. It seems desirable to employ a special term for a surface of marine denudation which is still in its original position at or near wave base, with the marine forces still operating on it, and for this feature the name "abrasion platform" has already been used. An uplifted abrasion platform of large areal extent is a marine peneplane or a marine plane, according to the smoothness of the surface produced by wave erosion.

The advantages of the suggested usage are obvious. It tends to simplify, not to complicate physiographic terminology. The origin of any of the level or almost-level surfaces here discussed is at once apparent from the spelling. If one uses the otherwise noncommittal term "marine plain" in the manner here suggested, the reader knows at once that a plain of marine sediments is referred to; while "marine plane" indicates a wave-cut

[3] "Subaerial" denudation was long used for "fluvial" denudation, because of the prevalent idea that there were only two important types of denudation, subaerial and submarine. Since the importance of aeolian denudation, which is also subaerial, has been recognized, it is desirable to distinguish the two types of subaerial denudation by the terms "fluvial" and "aeolian."

[4] J. H. L. Vogt: Über die schräge Senkung und die spätere schräge Hebung des Landes im nördlichen Norwegen, *Norsk Geologisk Tidsskrift*, Vol. 1, 1907, p. 17.

plane surface. When we remember that both of these forms have been called "marine plains," the advantage of the distinction in spelling is evident. One of our ablest physiographers has applied to a wave-cut rock bench along the coast, the term "coastal plain." Had he written "coastal plane," his meaning at least would have been clear, even though the term as a whole might still be criticized. A peneplain is not "almost a plain" of horizontal sediments but is almost a plane surface in the mathematical sense of the term; therefore "peneplane" more clearly expresses the true meaning of the term than does the older and commoner spelling. So standard a text as Dana's "Manual of Geology"[5] employs the spelling "peneplane;" while J. W. Gregory in his recent book on "The Nature and Origin of Fiords,"[6] makes use of the same form. Lawson has employed both spellings, the form "peneplane" occurring in his "Post-Pliocene Diastrophism of the Coast of Southern California."[7] It may be, also, that the combination of "plane" with "pene-" will seem less objectionable to those who dislike hybrid terms, since "plane" is closer to the original Latin form than "plain."

Davis' introduction of "peneplain" into the vocabulary of physiography in 1889[8] was a valuable service to the science; for it led to a speedy and worldwide recognition of a conception which had previously been announced but which did not become current until well named. It should be appreciated, however, that at this time the idea of subaerial denudation was supplanting, rather than supplementing, the idea of marine denudation. The general attitude was well expressed by De Lapparent in the words: "La notion des pénéplaines est extrêmement féconde, et ce n'est pas un de ses moindres mérites d'avoir porté le coup de grâce à la théorie des plaines de dénudation marine, si fort en honneur de l'autre côté du détroit."[9] Davis himself regarded extensive planes of marine denudation as "very improbable,"[10] while planes of glacial or aeolian denudation were as yet scarcely considered. All planes of penultimate stages of erosion were called "peneplains" because it was believed that they were all formed essentially by subaerial agencies. No need was felt of names for almost-plane surfaces of marine and other types of erosion, since the existence of such planes was either considered improbable or was not considered at all.

Later years have witnessed the publication of Passarge's studies of surfaces of aeolian denudation,[11] and the probability of the existence of fairly

[5] J. D. Dana: Manual of Geology, 4th edit., 1895, p. 204.

[6] J. W. Gregory: The Nature and Origin of Fiords, London, 1913, p. 195.

[7] A. C. Lawson: The Post-Pliocene Diastrophism of the Coast of Southern California, *Bull. Univ. of California Dept. Geology*, Vol. 1, 1893, p. 158.

[8] W. M. Davis: Topographic Development of the Triassic Formation of the Connecticut Valley, *Amer. Journ. Sci.*, 3rd Ser., Vol. 37, 1889, p. 430.

[9] La geomorphogénie, *Rev. des Quest. Scient.*, 1895.

[10] W. M. Davis: Geographical Essays, edited by Douglas W. Johnson, Boston, 1909, p. 291.

[11] Siegfried Passarge: Die Kalahari, 822 pp., Berlin, 1904; Rumpffläche und Inselberge, *Zeitschr. Deutsch. Geol. Gesell.*, Vol. 56, 1904, Protokoll, pp. 193-209; Die Inselberglandschaften im tropischen Afrika, *Naturwiss. Wochenschr.*, N. S., Vol. 3, 1904, pp. 657-665.

extensive surfaces of marine denudation seems now to be recognized by Davis and others.[12] We are confronted with the fact that there are numerous almost-plane erosion surfaces in various parts of the world, the origin of which is in most cases doubtful and in many cases will probably never be known because nearly all of the upland has been destroyed by subsequent stream erosion. As Davis once remarked, "It must be remembered that the terms 'plain of marine denudation' and 'peneplain' are in nearly all cases hardly more than different names for the same thing. If the whole truth were known, it is probable that one or the other name might be appropriately applied in this or that case, but it is seldom that anyone has succeeded in convincing all his contemporaries that he could distinguish a plain of marine denudation from a peneplain, or vice versa."[13] Present needs can better be met by applying the excellent term "peneplane" to all these surfaces and qualifying the term by the word fluvial, marine, aeolian, or glacial in case it can be shown that a given surface is of the origin indicated by the qualifier, rather than by inventing a new term for almost-plane erosion surfaces of doubtful origin. Peneplane is too valuable a term and is too extensively used to have it restricted to the very few (if any) erosion surfaces demonstrably of fluvial origin; and, since the wise physiographer avoids a name which commits him unwillingly to a certain theory of origin, it seems best in the present case to extend the meaning of the term.

While it is true that the writer is advocating a broader significance for "peneplane" than is usually given to it, precedent for such usage is not altogether lacking. H. E. Gregory is responsible for using the term as synonymous with "plain of denudation . . . . . carved out of other landforms either by the action of the forces that work on the land or by the waves of the sea."[14] Davis himself has occasionally employed the term in the broader sense. Thus, in an account of the geographic development of northern New Jersey, he discusses at length "whether the old Highland peneplain was the product of subaerial or submarine processes."[15] He distinguishes between "subaerial baselevel plain" and "submarine platform" but applies the name "peneplain" to the topographic feature itself, while its origin remains in doubt. In a discussion of the arid cycle by the same author,[16] "peneplains" are usually contrasted with true "plains" of aeolian erosion; but the frequent use of the expression "normal peneplain" and the application of the term "monadnock" to residuals on a plane of aeolian denudation suggest that the author at least unconsciously

[12] W. M. Davis: Meandering Valleys and Underfit Rivers, *Annals Assoc. Amer. Geogrs.*, Vol. 3, 1913, p. 27.
Idem, op. cit. sub 10, p. 374.
Joseph Barrell: *op. cit.*, p. 690.

[13] *Op. cit.* sub 10, p. 374.

[14] H. E. Gregory, A. G. Keller, and A. L. Bishop: Physical and Commercial Geography, Boston, 1910, p. 46.

[15] W. M. Davis and J. W. Wood: The Geographic Development of Northern New Jersey, *Proc. Bost. Soc. Nat. Hist.*, Vol. 24, 1890, p. 374.

[16] *Op. cit.* sub 10, pp. 276-322.

recognized the possible existence of peneplanes which were not formed by "normal" (stream) erosion. Marine peneplanes are more definitely recognized, at least as a theoretical possibility requiring discussion, when in an essay on planes of marine and subaerial denudation the author says: "By whatever process the so-called 'plain of denudation' was produced, an explanation that will account for a peneplain of moderate or slight relief is all that is necessary."[17]

It appears, therefore, that many considerations of weight favor a more general adoption of the spelling "peneplane" and the employment of the term to designate almost-plane surfaces produced in the penultimate stage of any erosion cycle. Should these considerations, as set forth above, commend themselves favorably to others, the writer suggests that they adopt the usage advocated and thereby assist in simplifying and clarifying physiographic terminology. Every extension of this usage, already established in certain quarters, will serve to render more precise the important conceptions for which the words plain and peneplane now stand.

[17] *Ibid.*, p. 340.

THE NON-EXISTENCE OF PEARY CHANNEL

Three years ago, Knud Rasmussen, the well-known Danish explorer, gave a preliminary account of his latest surveys in northern Greenland.[1] The results were of unusual interest because they not only connected up the work of Peary and Mylius Erichsen but corrected certain errors in the geography of northern Greenland that had persisted since Peary's first exploration of that coast in 1892.

There has just been received at the library of this Society Rasmussen's final report,[2] and geographers in this country should have great interest in it as setting straight at last a long-disputed point in Arctic geography. A review of Rasmussen's report will be published in the next number. Only the bearing of his surveys on Peary Channel will be considered in this note.

On the American expedition led by General A. W. Greely in 1881-1884, which formed part of an international co-operative undertaking to study Arctic conditions, the north coast of Greenland was surveyed by Lieut. J. B. Lockwood northeastward as far as Cape Washington (see map, Fig. 1). A reference to the map of these surveys[3] shows many fiords running toward the interior. The next traverse along this coast was that of Peary in 1900, when he reached Cape Wyckoff, some 150 miles beyond Lockwood's farthest.[4] It was on his earlier expeditions of 1892 and 1895 across the ice-cap of northern Greenland that Peary reported[5] the existence of a transverse channel which was supposed to mark the limits of Greenland on the north and establish its insularity. The channel was supposed to emerge at Nordenskiöld Inlet on the northwest. The official chart of the region by the U. S. Hydrographic Office[6] incorporates this feature and designates it "Peary Channel"; likewise many other charts and maps, including the large standard map of Greenland published in Denmark in 1906.[7]

The reported discovery was challenged from the first. Peary's companion, Astrup,[8] asserted the unbroken extension of Greenland far north of Navy Cliff, perhaps the

---

[1] *Geogr. Journ.*, Vol. 41, 1913, pp. 593-594 (abstracted in *Bull. Amer. Geogr. Soc.*, Vol. 45, 1913, p. 618); *La Géogr.*, Vol. 27, 1913, pp. 375-377.

[2] Knud Rasmussen: Report of the First Thule Expedition, 1912, *Meddelelser om Grønland*, Vol. 65, No. 8 (= pp. 285-340), 1915, with map, 1:1,300,000, by Peter Freuchen, of the connection between Peary Land and the mainland of Greenland. See also the other reports on the expedition in the same volume, designated Nos. 9 to 13, inclusive, especially Peter Freuchen: General Observations as to Natural Conditions in the Country Traversed by the Expedition, No. 9 (= pp. 343-370).

[3] Chart of Coast of North Greenland, 1:900,000 facing p. 186 of Vol. I of "Report on the Proceedings of the United States Expedition to Lady Franklin Bay, Grinnell Land," by A. W. Greely, 2 vols., Washington, 1888.

[4] Report of R. E. Peary, C.E., U. S. N., on Work Done in the Arctic in 1898-1902, with map, 1:3,168,000, *Bull. Amer. Geogr. Soc.*, Vol. 25, 1903, pp. 496-534; reference on pp. 517-520.

[5] R. E. Peary: The North Greenland Expedition of 1891-92, *Journ. Amer. Geogr. Soc.*, Vol. 24, 1892, pp. 536-558; reference on p. 555 under (3): "the existence of detached ice-free land . . . to the northward."

Cyrus C. Adams: Lieutenant Peary's Arctic Work, *Geogr. Journ.*, Vol. 2, 1893, pp. 303-316, with map, 1:3,000,000; references on pp. 310-311 and on the map, which shows the transverse channel.

R. E. Peary: Northward Over the "Great Ice," 2 vols., Stokes, New York, 1898; reference in Vol. I, pp. 345-346 *et al.*

[6] Baffin Bay to Lincoln Sea, Polar Regions, showing the recent discoveries by Civil Engineer R. E. Peary, U. S. N., . . . 1:1,400,000. Chart No. 2142, 1903.

[7] Kort over Grönland, udgivet af Commissionen for Ledelsen af de geologiske og geographiske Undersögelser i Grönland. 1:2,000,000. Copenhagen, 1906.

[8] Eivind Astrup: Lœitnant Peary's Grønlandsekspedition, 1891-92, *Det Norske Geogr. Selskabs Årbog*, Vol. 4, 1892-93, pp. 25-44, with map of northern Greenland, 1:6,000,000; reference on p. 43.

In Astrup's subsequent book, "With Peary Near the Pole" (transl. from the Norwegian by H. J. Bull, Lippincott, Philadelphia, 1898), he modified his first view and favored the channel theory both in the text (pp. 227-228) and on the map.

most critical observation point in their journey for the determination of a cross channel, and so represented it on his map. Rabot[9] reviewed the discussion in 1894, asserting his faith in Astrup's contention, but in this country Rabot's conclusions were discredited.[10] And the government maps until within a few years gave the weight of official sanction. Astrup's first report is now proven to have been correct. First came Mylius Erichsen in 1906-1908, exploring the northeastern coast to the head of Independence Bay.[11] He died from cold and starvation in 1907 but left a report in a stone cairn that established the fiord-like character of Independence Bay and the non-existence of Peary Channel.[12] In 1909-1912 Mikkelsen conducted a search expedition to the region, found Erichsen's record and to some degree extended his work.[13] Koch, of the Mylius-Erichsen expedition, in 1907 carried his surveys far northward to Cape Bridgman, thus connecting with Peary's coastal surveys of 1900.[14] Rasmussen, also searching for Erichsen, in 1912, found no record of Mikkelsen, owing to the latter's neglect to leave a report in the cairn from which he took Erichsen's last message.[15] Anxious to settle the channel problem Rasmussen skirted Mylius Erichsen Land and adjacent lands, crossed and went to the head of Independence Fiord and actually traced the land connection of so-called Peary Land with Greenland. To Erichsen belongs the credit of proving Peary Channel non-existent, to Rasmussen the credit of mapping it, and to Koch the credit of mapping the last corner of northeastern Greenland that was unknown until then (1907).

The final question is, What physical conditions led Peary to believe in a channel when an upland and high relief actually exist? With rare delicacy an explanation has been framed by Rasmussen himself. In Peary's cairn at Navy Cliff Rasmussen found Peary's now well-known letter dated July 5, 1892, recording his arrival at Independence Fiord. The letter makes no mention of the discovery of Peary Channel, and on this Rasmussen comments as follows:[16] "As will be seen from the above, Admiral Peary makes no mention here of any channel, and even calls the place Independence Fjord. It must therefore have been at a later date that the idea arose as to a channel between North Greenland and Peary Land. In any case, it is found marked on all American maps under the name of Peary Channel. It is also impossible to see the base of the fjord from the point on Navy Cliff where the cairn was built: all that can be seen is that the ice from the fjord runs farther on inland. This, with the fact that a hollow runs through Valmuedalen over towards Nordenskjöld's Inlet on the west, explains how the theory originated."

Neither the maps nor the charts based on data furnished by Peary show Peary Channel as a surveyed but only as a probable connection between Nordenskiöld Inlet on the west and Independence Fiord on the east. On the other hand Peary's account

---

[9] Charles Rabot: Les récentes explorations arctiques, *Compte Rendu des Séances de la Soc. de Géogr.* [*de Paris*], 1894, pp. 428-437; reference on p. 433.

[10] *Journ. Amer. Geogr. Soc.*, Vol. 27, 1895, pp. 60-62.

[11] Cf. A. Trolle: The Danish North-East Greenland Expedition, *Geogr. Journ.*, Vol. 33, 1909, pp. 40-65, with map, 1:4,000,000.

Achton Friis: Im Grönlandeis mit Mylius Erichsen. German translation from the Danish by F. Stichert. 2nd. edit. Spamer, Leipzig, 1913.

G. Amdrup: Report on the *Danmark* Expedition to the North-East Coast of Greenland, 1906-1908, *Meddelelser om Grønland*, Vol. 41, No. 1 (= pp. 1-270), 1913, with map of northeastern Greenland, 1:2,000,000, Pl. II. [The official report.]

[12] G. C. Amdrup: Mylius-Erichsen's Report on the Non-Existence of the Peary Channel: Information Brought Home by Ejnar Mikkelsen, *Meddelelser om Grønland*, Vol. 41, No. 5 (= pp. 471-474), 1913.

[13] Einar Mikkelsen: Expedition to North-East Greenland, 1902-12, *Geogr. Journ.*, Vol. 41, 1913, pp. 313-324, with map, 1:4,000,000.

Ejnar Mikkelsen: Lost in the Arctic, Doran, New York, 1913, with map, 1:2,000,000.

[14] *Op. cit.* in footnote 11, third entry, pp. 124-135.

[15] *Op. cit.* in footnote 2, p. 317.

[16] *Ibid.*, p. 326

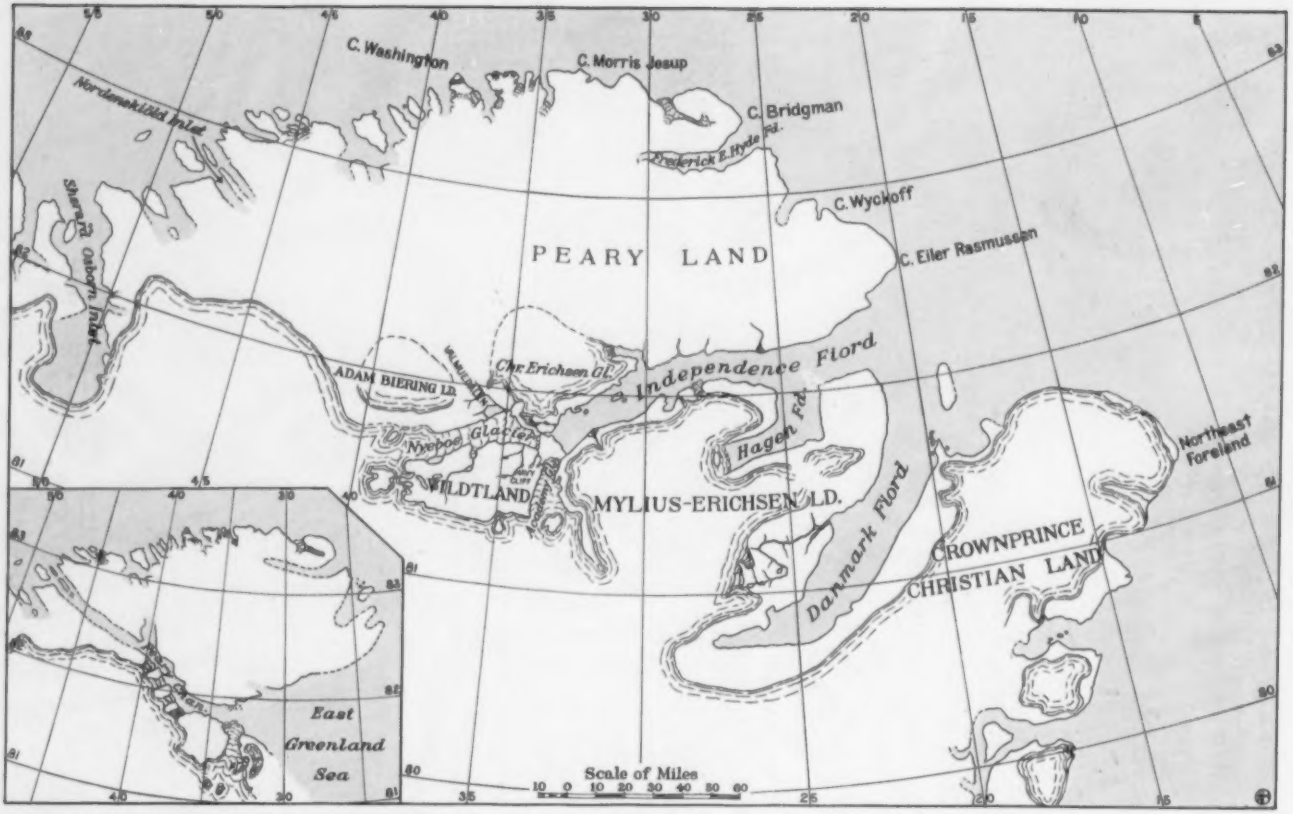

FIG. 1—Sketch map of northernmost Greenland according to present knowledge, based on the surveys of the Greely (1882), Peary (1892 and 1900), Mylius Erichsen (1906-08), and Rasmussen (1912) expeditions. Scale, 1:3,850,000. For the map sources see footnotes 3, 6, 11 (third entry), and 2.

The inset shows the supposed Peary Channel as represented on U. S. Hydrographic Office Chart No. 2142.

of the "fiord," later called "channel," and his conclusion regarding it are positive and clear, though carried to lengths not warranted by his observations. In "Northward Over the 'Great Ice,'" page 317, and again on page 318, a fiord is mentioned near the northern end of Peary's inward march. The most significant passages occur later. "Looking to the west [from Navy Cliff, see map, Fig. 1], we saw the opening of the fjord [later known as Peary Channel] that had barred our northern advance. . . . Now we knew that we had paralleled its course across the northern end of the mainland from Robeson Channel clear to the Arctic Ocean off the shores of north-east Greenland. For days we had kept constantly in view the mountain masses forming the southern boundary of this channel, and through rifts in the mountains we had from time to time seen this depression, and had now and then caught glimpses of the frozen channel occupying it; and we had seen beyond it mountains and fjords stretching between them. It was evident that this channel marked the northern boundary of the mainland of Greenland" (pp. 345-346). . . . "There is every reason to believe that to the northwest, north, and north-east we were gazing upon an archipelago whose western limits Lockwood had discovered in 1882" (p. 347). A deep fiord may enter from the west along the line of the supposed Peary Channel. For the rest, as above quoted, the conclusion rested upon "glimpses," "from time to time," "through rifts," "in [distant] mountains," of what was supposed to be a channel or fiord. Glaciers of low gradient may under such circumstances have been mistaken for an ice-coated fiord. Nyeboe Glacier lies approximately in the line of continuation of Independence Fiord and Peary Channel. On the other hand, Rasmussen thinks that the Valmuedalen depression may have been mistaken for a channel.

Thus in the long progress of charting the world's coasts some things are "put on the map," to be taken off again as detailed surveys take the place of reconnaissance journeys and actual traverses and maps are substituted for sketches and hypotheses based on distant views. But we should be careful to give proper credit to the pioneer in any region, even if the pioneer sometimes draws too large and dramatic a conclusion from a small, though valuable, body of fact.

When an error is discovered an explorer's critics seldom take the trouble to look for extenuating facts. We have called attention to several in the paragraph above. There is one which is still more important. Greenland is in general a high plateau, a vast ice-coated carapace. Nansen, De Quervain, Koch, Rasmussen, and Peary are all agreed as to its topographic character. Koch found mountains reaching above 9,500 feet in latitude 72°, but that is quite exceptional. At the border the ice sheet exhibits a zone of transition where valley glaciers alternate with rugged forelands. The visible *relief* of the island is greatest at its border. The northern end of Greenland appears to be exceptional in this respect. Its physiography is distinct. Instead of a dome-shaped plateau covered with ice it appears to be a mountainous region with deep valleys filled with and scoured by ice and thus transformed into peaks, uplands, and glacial troughs. Peary knew the west and north coasts well. When in his journey of 1892 he reached the northern limit of the main ice sheet, the *inlandeis*, as it is termed, and saw before him mountains separated by deep valleys, it was altogether natural for him to suppose that he was near the limits of the northern coast. The deep glacier-filled valleys at a distance looked like fiords. Further exploration of the region would now be desirable; in fact Mikkelsen planned both to explore and to survey the land along the supposed channel in 1910,[17] but learning through Mylius Erichsen's report of the non-existence of the channel was obliged to turn back. It appears that the local ice fields of "Peary Land" are separated from the main Greenland cap, along the line of the now disproved "Peary Channel," by a belt of rugged country. Lieut A. Trolle reported[18] that

[17] *Op. cit.* in footnote 13, first entry, p. 317.

[18] *Op. cit.* in footnote 11, first entry, p. 52.

Peary Land is not covered with inland ice and that it has mountains up to 2,000 feet in height—facts based on the report of Koch, topographer of the Mylius-Erichsen Expedition. Peary discovered some quite remarkable physiographic features, a fact we should not forget in noting corrections in his interpretation of them. Also he made a sledge journey across Greenland which up to that time had no equal in polar exploration.

THE AFRICAN COLONIES OF GERMANY AND THE WAR

As a part of the military operations of the war, the four African colonies of Germany were attacked by the Allies. Three, German Southwest Africa, Kamerun, and Togo, have been conquered, while in German East Africa fighting is still going on. Their ultimate fate depends upon the final issue of the war. These colonies[1] have a total area of 1,030,150 square miles and are thus a little more than four times as large as Germany. At the beginning of the war, in August, 1914, they had reached a stage of prosperity that bade fair to justify the enormous expenditure of money, if not the appalling loss of life, chiefly native, that had marked their development. They were all in a thriving condition though still in the early stages of their history.

In the management of her colonies, Germany has shown marked limitations as well as superior qualities. In her dealings with the natives, coercion has been the policy, though England, for example, has found it wise as well as humane to use severe measures only when milder methods have failed. The military expenditures have been enormous in all the German colonies excepting Togo. Between 1891 and 1903, Germany sent out twenty-nine punitive expeditions against the Kamerun natives. No other power in Africa has waged such a war against primitive blacks as that which, in two years, nearly exterminated the Hereros (Bantus) of German Southwest Africa. In brief, German administration in the African colonies has very often been too inflexible, rigid, and tactless to meet the condition of natives, most of whom would have been tractable if some degree of deliberation, patience, and kindness had characterized the dealings with them.

In some other respects, however, and chiefly along the lines of scientific development, Germany has excelled all other colonial powers in Africa. She has carried on scientific surveys upon which are based the maps of parts of her large territory—maps that are unsurpassed and rarely equaled by those of any other of the colonial powers. The colony of Togo is the only part of colonial Africa whose detailed topographic map is completed.

When Germany entered the colonial field in 1884 it was generally believed by the other powers that all the more promising parts of Africa had already been appropriated. Germany did not long delay the initiation of a most thorough and scientific investigation of colonial resources and possibilities of development. As the prospects were gradually unfolded Germany, as well as the other powers, were surprised by the revelation of the potential value of all her colonies. German Southwest Africa, chiefly reputed to be a wide zone of worthless sand, was found to be rich in gold, diamonds, and other mineral resources, with wide areas of agricultural and grazing lands in the north, large opportunities for the reclamation of lands in the east by means of irrigation, and a climate that fitted the country to become the home of many thousands of white settlers. When England seized the colony last year she found there some 15,000 German farmers whose homes were surrounded by gardens, fields, and pastures.

---

[1] German Southwest Africa, acquired April 24, 1884; Togo, July 2, 1884; Kamerun, July 14, 1884; German East Africa, February 17, 1885.

Germany made her most intensive studies in German East Africa especially to discover the range of agricultural possibilities and the distribution of mineral resources. The Agricultural Department at the capital, Dar-es-Salam, was supplemented by some twenty substations, scattered all over the country, where studies were made of the soils, their adaptation for growing tropical export crops, the varieties of cotton and other plants that were best adapted for each locality, etc. A little back of the northeast coast the Germans developed the cultivation of sisal fiber till their exports bade fair to rival in quantity those of Yucatan. They found gold in the north-central parts of the colony and in the Ruanda highlands of the northwest; and among their other discoveries were two districts, one south of Mount Kilimanjaro and the other in southern Ruanda, which, by reason of their elevation, were well adapted to become the homes of white men. Several hundreds of German, Boer, and Greek farmers and cattle raisers are now settled within view of the loftiest of African mountains on the southern part of the same high plateau that is occupied by British colonists in British East Africa.

The Germans know Togo as well as they do the two colonies referred to above; but Kamerun, in its climate, mountainous topography, and the unfriendly attitude of some of the stronger tribes of the interior, has given Germany its most perplexing colonial problem. All the region directly tributary to the Atlantic border has, however, for years supplied a large amount of rubber, palm oil, and cacao. Though a large part of Togo is covered with forest, the country, as a whole, may be called a great tropical plantation; and though its coast line is only thirty-two miles long, a large amount of palm kernels, oil, rubber, and cotton passes through the one good, open port of Lome, the capital.

The war was scarcely a fortnight old when the Senegalese soldiery of England and the well-trained black infantry of French West Africa, officered by whites, swooped down upon Togo. The little colony was able to offer very little resistance and, on August 26, 1914, was in full possession of the Allies. It was the only easy conquest that the English and French have made in their assaults upon the German colonies. The Germans themselves had no such easy entry into Togo when they annexed it in 1884. The missionaries were opposed to German rule and are said to have been one of the factors in stimulating native resistance which, however, against German guns, was very short-lived; but the populace seem to be taking kindly to the new régime which the Allies have introduced. In 1912, Togo had a foreign trade of over $10,000,000, of which nearly half were exports.

German Southwest Africa was next to fall. General Botha, with a strong force from the Union of South Africa, landed, in January, 1915, at Walfish Bay. By dint of hard fighting, Botha worked his way up the hills towards Windhuk, the capital, building as he advanced a military supply road and guarding his communications with the coast behind him. Meanwhile, large reinforcements for Botha had landed at Lüderitz Bay about 250 miles to the south. They found the new railroad to Keetmanshoop and the north in good order and traveled rapidly on their way till they joined Botha; and the combined forces soon entered Windhuk, where Governor Seitz surrendered all the German forces to the invaders. It was a hard but a short campaign and a complete victory for the British.

German East Africa is undoubtedly the most valuable possession that the Germans acquired in Africa. They were very tardy in building the railroad between Dar-es-Salam and Lake Tanganyika, which now completes a fine avenue for trade between the Indian Ocean and Central Africa. This is the eastern link in the transcontinental line of steam communications, by rail and water, now finished from the Indian to the Atlantic Oceans.[2] The trade of German East Africa was more than trebled in the four years before the war. Its population is about 7,050,000, of whom 3,500 are Germans.

[2] See note, with map, in *Bull. Amer. Geogr. Soc.*, Vol. 47, 1915, pp. 449-450.

The Germans began the trouble late in September, 1914, by raiding across the border into British East Africa but they were driven back by Indian troops and Arabs from Zanzibar. Then British warships bombarded the capital, Dar-es-Salam, and other towns along the German frontage on the Indian Ocean; and for over a year there has been desultory fighting along the border between British East Africa and German East Africa and recently on Lake Tanganyika; but in no sense have the British so far (May 15) secured effective possession of the German colony.[3]

In the spring of 1915, the British bombarded and captured the Kamerun ports of Victoria and Duala, took possession of Buea, capital of the colony, and drove eastward into the mountains the Germans, who scattered wire entanglements between themselves and the Allies in intervals of fighting. In January, 1916, Jaunde, 200 miles inland, was captured, where the Germans occupied a fortification that they built some years ago as a center for punitive expeditions against disaffected natives. The French also led troops from French Equatorial Africa across eastern Kamerun to meet the British advancing from the Atlantic. The Allies had thus occupied a line extending approximately east and west across central Kamerun; and, late in February, they drove the remnant of the Germans into Spanish Guinea and were at last masters of the colony.

The effect of the war on the whole of colonial Africa has been to kill enterprise of all kinds. Africa is dead today as far as commerce, development, and exploration are concerned. There is no movement whatever on the completed steam route between the Indian Ocean and the mouth of the Congo. South Africa is keeping her newly mined gold and diamonds at home because the risk in sending them to Europe is too great. There is no hope that Africa will recover from the present stagnation till the war is over.

CYRUS C. ADAMS.

---

[3] For an account of the military actions in German East Africa see F. R. Cana: Frontiers of German East Africa, *Geogr. Journ.*, Vol. 47, 1916, April, pp. 297-303.

GEOGRAPHICAL RECORD

NORTH AMERICA

Reindeer Experiments in Canada. The preliminary success of Dr. Wilfred Grenfell's reindeer experiments have already been noted in scientific journals. The *Canadian Forestry Journal* now reports (Vol. 12, 1916, pp. 481-482) on the value of a part of the original herd in browsing off hardwood seedlings on evergreen plantations in Quebec. They devour the hardwoods and do not touch the conifers and thus succeed where other methods have failed. On the other hand, the attempt to "colonize" the Mackenzie River country at Fort Smith by sending thither a part of the Newfoundland herd has ended in failure. Forty reindeer were placed in a reserved area and left to themselves, but up to a year ago only three were alive. Further experiment is needed, however. The Canadian Northwest has immense reserves of suitable forage for reindeer, and the success of the Alaska experiment is too great to fail to impress the pioneer people of the lower Mackenzie.

The Forest Regions of Central British Columbia. Central British Columbia—that part of the province lying roughly between the 51st and 57th parallels—is a region of great though still undeveloped timber resources (The Forests of Central British Columbia, by H. R. Christie, *Forestry Quart.*, Vol. 13, 1915, No. 4). Nearly 80 per cent, or 80,000,000 acres, is forested, and of this the major portion, about 70,000,000 acres, represents ultimate forest land or land that in addition to its forest products can be utilized only for summer grazing. Exploitation is comparatively small as yet. It gives occupation to a majority of the wage earners, but the population is only one to every ten square miles. It is estimated that complete use of the present timber would bring the province $2,000,000 per annum in royalties alone, while under proper management the yield could be doubled.

Of the six main types of forest the most valuable are those lying to the east and north of the Interior Plateau. The "interior wet belt" of the Gold, Cariboo, Selkirk, and Rocky Mountains, with warm summers and a yearly precipitation of 30 to 40 inches, has a rich and varied forest distinguished by rapid growth and large yield. Cedar, hemlock, Engelmann spruce, Douglas fir, lodgepole pine, Alpine fir, and white pine are the chief species. About 75 per cent of the area has been burned over in the last half century, but the second growth is of good quality. Northward, the Upper Fraser basin constitutes another region of great possibilities. In temperature and precipitation and arboreal type it is an intermediate between the "interior wet belt" and the "northern forest." It comprises under a fifth of the forested area, somewhat less than the northern forest. The latter occupies the upper basins and headwaters of the Skeena and Peace Rivers. Precipitation, chiefly in the form of snow, amounts to about 20 inches; summer frosts are common, and the forest approaches the sub-alpine type; it is dense and slow-growing. Engelmann spruce and Alpine fir are the dominant species. The forest will be a producer of spruce lumber and pulp. The Interior Plateau, with a part of the western slope of the Rockies south of Yellowhead Pass, accounts for a quarter of the forested area. The small rainfall—10 to 20 inches—is not favorable to good forest growth. Trees are small, and, beyond local use, pulp will be the only considerable product. Unfortunately much of the Douglas fir has been lost by fire and replaced by the less valuable lodgepole pine, the principal species, and poplar. In the deep valleys of the plateau, with hot summers and limited rainfall, grass competes successfully with trees. The parklike forests of the Fraser and North Thompson Rivers are characterized by yellow pine, useful for local needs only. The remaining quarter of the area, the islands and the western slopes of the Coast Range, is covered by the "north coast forest." Abundant precipitation and equable climate are offset by steep slopes and lack of mineral soil. Tree growth is small, and good stands of saw timber of rather local occurrence. This feature, in combination with the wonderful water-power resources, should encourage a development of the pulp industry. Western hemlock, with red cedar and some yellow cedar, and Sitka spruce, are the distinguishing species.

Canadian Trade in 1915. Very significant is Canada's changed standing in foreign trade; thanks largely to the war she has now become a creditor nation. Whereas 1914 showed an adverse balance of $50,000,000 in the import and export of merchandise,

1915 showed a favorable balance of over $240,000,000, gained chiefly by an export increase of nearly 50 per cent (Canada, *Suppl. to Commerce Repts.*, Ann. Series, No. 23a, Washington, 1916). The most distinctive feature of Canadian prosperity in 1915 was the bumper wheat crop of the Northwest Provinces, which is estimated at about 343,000,000 bushels as compared with a little short of 141,000,000 bushels in 1914. Oats and barley show like increases (Canada: Prairie Provinces, *Suppl. to Commerce Repts.*, Ann. Series, No. 23c, Washington, 1916).

Geographic Controls in the Development of Minnesota. In the February number of the *Journal of Geography* is a group of striking essays on the geographic development of Minnesota. One of these, by C. J. Posey, deals with the "Geographic Influences in the Exploration and Early Development of Minnesota." The white man's entry into the state was controlled by the hydrography. The country is a glaciated plain at the head of three drainage systems, the Mississippi, the St. Lawrence, and the Red River, which afford easy access to it. Thus, in spite of its interior position, the territory was entered at an early date. The first authenticated entrance was that of Sieur Duluth in 1679, though it is not improbable that Radisson and Groseilliers were within the boundaries of the present state twenty-four years earlier. The French voyageurs came for furs, the article that formed Minnesota's principal production until 1850. The fur industry, leading to the establishment of trading posts on the main routes, attained its zenith in 1843, when the Hudson Bay Company installed the line of Red River carts connecting St. Paul with Winnipeg. Even today St. Paul remains the primary fur market of the United States, though the Government market for Alaskan furs has recently been instituted in St. Louis.

Unfortunately the water highways are closed to commerce for five months of the year; hence, until the coming of the railroad and the telegraph, Minnesota suffered much from winter isolation. Old newspaper records recounting the way in which the mail was carried by dog train over the ice are reminiscent of present-day methods in Alaska. The first permanent settlements were commonly located about the falls on the rivers where a break in transportation was necessary and where sources of power later led to the creation of urban centers. The establishments below the falls of St. Croix and St. Anthony are early and well-known examples.

The forests constitute the next control of importance. They were, it is true, an impediment to travel—many of the roads made long detours to keep to the prairie—but the disadvantage was far outweighed by the value of the forestal resources. As the output of eastern woods began to diminish the woodsmen turned westward. The pioneers of lumbering in Minnesota came from Maine. By 1850 the lumbering had surpassed the fur industry.

The succeeding decade was remarkable for the development of agriculture. Of the three assignable causes, two—the introduction of labor-saving machinery and railroad building—were common to other sections of the country. The third, the discovery of a new milling process, was peculiar to the spring-wheat area of the Northwest. Its improvement of the grade of flour obtainable from this variety of wheat immediately put a new value on the Minnesota grain and laid the foundation of the state's prosperity (The Wealth of Minnesota, by E. V. Robinson, *Journ. of Geogr., ibid.*). During this decade of agricultural expansion the population increased by 2,730 per cent, a phenomenal figure unrivaled by any other state.

Mineral wealth was the last great resource to be developed. Exploitation of the vast iron ore deposits of the Ranges did not commence until 1884, but, once started, the mushroom towns of the Ranges sprang up quickly enough (Minnesota Cities: Duluth and the Range Towns, by Eugene Van Cleef, *Journ. of Geogr., ibid.*). Hibbing (Mesabi), founded in 1892, now has a population of 12,000. Duluth, the greatest product of the mining industry, with 5,000 people in 1880, is today accredited with 85,000. (Cf. also "Population Controls in Montana" in the March *Review*, p. 217.)

Seismic Activity in California During 1915. To the student of earthquakes California is by far the most interesting state in the Union. Records for last year collected from 179 stations show a total of 83 shocks, a number exceeding that for the remainder of the states combined (California Earthquakes During 1915, by Andrew H. Palmer, *Bull. Seismolog. Soc. of America.*, Vol. 6, 1916, No. 1). The earthquakes appear to have been purely tectonic in character. Analysis of the major shocks shows deep-seated foci, with comparatively long duration of time between preliminary and maximum vibrations and widespread occurrence. Not a single earthquake occurred contemporaneously with an eruption of Mount Lassen. The year afforded a good test of relations between volcanic action and earthquakes, for the volcano maintained a state of unusual activity. Shocks were more severe and numerous in the south of the state, the worst recorded,

that of June 22, involving destruction of life and property. With the exception of the Imperial Valley more shocks were registered on the coast than in the interior, a phenomenon probably explainable as a resultant of recent and progressive uplift along the eastern scarp of the southern Sierra Nevada. San Francisco, in a zone of heavy faulting and apparently at the crossing point of opposed stress planes, is associated with high seismicity. Lone Pine, Owens Valley, formerly a notorious seismic center, only experienced a single shock during the year. The increased seismicity in the Imperial Valley, and in Pleasant Valley, Nevada, suggests that migration has taken place along a fault line.

The Carnegie Institution's Investigations in the Salton and Mohave Desert Regions. Brief accounts of the research work carried on in these desert regions under the auspices of the Carnegie Institution of Washington are contained in its *Year Book for 1915* (p. 90-97). Weekly gage-readings of the level of water in the Salton Sea gave a total recession of about 50 inches for the year ending July 1, 1915. Data on the composition and rate of concentration of the chemical constituents were obtained. Material was also gathered on the history of Blake Sea, the ancient precursor of Salton Sea, which promises to be of importance in determining the climatic cycles and the geological succession of plants in the Mohave Desert region. A general reconnaissance of the vegetistic features of this area was made in the autumn of 1914 and the spring of 1915 by Forrest Shreve. This investigation confirmed former results on the slight amount of habital differentiation exhibited by the native plants.

Ellsworth Huntington's studies of climatic changes were continued in the principal basins of the Mohave Desert. Possible evidences of climatic changes found in the terraces and alluvial deposits of the *bajada*, or débris-apron, type by this investigator and E. E. Free afford a new aid in the correct interpretation of these physiographic elements. In the course of these studies Huntington also considered the relation of playas to climatic changes. The stages of their development contribute valuable clues. Death Valley and the area draining into it is an inviting field for these climatic researches. The final correlation undertaken of the diverse types of evidence, botanical, chemical, and physiographic, reveals a close degree of correspondence. A comparison, for example, of the curve of the growth of the sequoia tree and the old strands in Owens Lake shows that periods of high water in the lake corresponded with periods of rapid growth in the trees.

Migrations of Animal Life Over the Isthmus of Panama. Intermigration of animals between the northern and southern continents of America was the subject of a lecture delivered in August, 1915, by Professor W. B. Scott at the San Francisco meeting of the American Association for the Advancement of Science. The lecture is published in *Science* for January 28, 1916 (pp. 113-124).

The zoölogical relations between North and South America were dominated principally by the geography, past or present, of the Isthmus of Panama. Differences in the faunas of the two regions point to extensive geological changes. Periods of land connection and of absolute separation succeeded each other. In the former case likeness of species would be established. In the latter a complete dissimilarity of animals would result. Climate also played its part, as the migrations took place only under favorable climatic conditions. They reached their culmination in the Pleistocene, when mammals common to the two continents appear in greater variety than at any other period. The number of South American types found in North America is small. The list practically does not comprise more than opossums, a few rodents, ground-sloths, and glyptodonts. In contrast to this the range of northern forms present in South America is extensive. These include—to mention only a few—bears, cats, otters, rabbits, mice, horses, llamas, and deer.

Professor Scott attributes this predominance of northern animals over southern to the higher stage of intelligence and of structural development attained by them. He refrains, however, from pointing to the heliotropic instinct present in many forms of life and which compels a search for warmer climates because of the greater ease with which sustenance is derived in lands of sunshine. The southern forms had no equivalent inducement to press northward.

In the Oligocene epoch a broad sea intervened between North and South America. The date of the reappearance of land cannot yet be determined with precision; it probably took place at the close of the Oligocene. The ground-sloth in the middle Miocene beds of Oregon proves that connection had been re-established in the early Miocene. The isthmian region appears to have been broader in the Pliocene, although the isthmus was depressed once more beyond its present limits at some time during the Pleistocene.

The separation of South American mammals into two radically different groups is an evidence of migration. One of the assemblages is autochthonous, the other immigrant. Highly characteristic edentates and a large number of peculiar rodents take rank in the first group. The foreign arrivals consist of beasts of prey and hoofed animals. On the northern continent the southern forms represent remnants of early immigration which could not take deep root on account of climatic obstacles. Central America and the West Indies belong zoölogically to South America. Professor Scott's lecture throws into relief the significant part played by the geographical history of the Isthmus of Panama.

EUROPE

Strategic Features of the Baltic Basin. From the strategic point of view the topography and hydrography of the Baltic Basin present several features of interest (Charles Rabot: La Baltique, *La Nature*, Jan. 1, 1916; Les détroits Danois, *ibid.*, Feb. 26, 1916). The slight salinity of the Baltic waters in contrast with those of the open ocean involves flotation problems both for surface and submarine craft. At the entrance to the sea vessels from the ocean must for each thousand tons' displacement lighten by thirty tons to maintain the normal water line. This circumstance, combined with the frequency of shallows, renders navigation a delicate matter for the smaller submarine with a limited degree of floatability. Some compensation, however, arises from the opacity of the waters, fed to so great a degree from the land. Recent physiographic development creating a fiord type of coast along the north and west has produced features favoring defense and navigation. Behind the outer island wall lies an interior line of communications. Vessels of considerable draft can go from Åland to Kronstadt without passing into the open sea. The similar Swedish line from the extremity of the Gulf of Bothnia to the southern end of the Strait of Kalmar has proved of great service to the German ships carrying ore from northern Sweden to Stettin and Lübeck. Its importance may be gaged by the magnitude attained by the trade—during the first nine months of 1915 no less than 2,000,000 tons of ore were shipped to Germany—and the growth of the port of shipment, Luleå.

The strategic interest of the Baltic concentrates in the "defile" of its entrance. The salient features of the Baltic straits are their narrowness and shallowness. They also offer impediments to navigation in their complex and variable currents. The surficial outward-moving current of fresh water, often of slight depth, is susceptible to rapid change in direction with changing winds. Where the water is shallow local eddies are not infrequently caused. Shallowness is the greatest impediment in the Sound. The decline of this most direct route is due in part to the growth of modern vessels as well as to the construction of the Kiel Canal. The Little Belt is deeper but the route longer and its southwestern shore is German territory. The Great Belt, still deeper and more commodious, has been carefully mined. Since the development of the railroad ferry service, the straits may be considered as a land no less than a water defile. By the four lines operating in the straits and the fifth connecting southern Sweden with the German mainland via Rügen transportation proceeds from Scandinavia to Germany without a break. From the beginning of the war, with a slight interruption during the winter of 1914-15, activity along these routes has been unparalleled, for the defile not only concentrates lines of traffic and serves as a depot of supplies but itself lies in a zone of great industrial activity.

Geographical Conditions in the French Alps in 1700. The geographical value of archival documents is specifically illustrated in the paper "Le Haut Dauphiné à la fin du xviie siècle" by Professor Raoul Blanchard (*Recueil des Trav. de l'Inst. de Géogr. Alpine*, Vol. 3, 1915, No. 4, Grenoble). The documents in question pertain to the last of a long series of processes of reassessment for taxation (*procès-verbaux de la révision des feux de 1700*). They comprehend three classes of material of unequal value for geographic interpretation—the remonstrances of the assessed communities, their responses to the formal questions of the assessment, and the reports of the assessment commissions. The communities naturally exaggerated the adverse circumstances of their situation. The importance of climate they fully recognized. To its wretched character they attributed a major portion of their woe. But the statements of neighboring communes are inconsistent, and all are at variance with the nature of the agricultural life revealed in the responses and reports. These demand a climate not very different from that of today. The distribution of such critical plants as the olive, almond, and walnut is identical with that of the present. The vine and the principal cereals were indeed more widely cultivated, for in those days of limited transportation specialization was little known, communities were largely self-supporting. Pastoral industry, too, was entirely subordinate.

Meteorological data, of course, are lacking but, assuming the small cyclic variations that appear in the observations continued over a 125-year period in neighboring Savoy (Annecy), the end of the seventeenth century should have been under favorable temperature conditions. This is confirmed by the contemporaneous state of the glaciers of Savoy. The facts of emigration were likewise adduced by the inhabitants as a proof of general distress. Yet the phenomenon of emigration was then as now an apparently normal response to the mountain environment. Chiefly temporary and seasonal in character, it only attained considerable dimensions at the higher elevations. Altitude and emigration were in close agreement. The movement, for instance, was unknown in the pleasant valley of Grésivaudan. In the mountains, where the chief cereals were only harvested once in two years—the grain takes thirteen months to mature—and where winter industries did not obtain, the peasant solved the question of subsistence by migration for five, six, or seven months of the year. The emigration had no specific objective. It penetrated all France and led the mountaineer into a variety of work, chiefly of laborious and inferior nature. The men who were absent for the longest period of time devoted themselves most largely to petty commerce—peddling. Apart from religious and other exceptional causes the attraction of this lucrative business was perhaps mainly responsible for a certain percentage of population being drawn permanently away from the mountains.

The assessment figures unfortunately do not permit of an entirely satisfactory estimate of the population of the time. They give the number of "hearths" but no clue to a transforming factor. For a study of comparative distribution the empirical figure 4.5 may be taken as the factor for transforming the family unit into individuals. The results so obtained are what might be anticipated. The towns and valleys have gained in population since 1700, the high mountains have lost.

Improvements in Internal Communication to the Port of Marseilles. The opening, on May 7, of the Marseilles-Rhône canal will make possible direct communication between Lyons and Marseilles for the considerable barge traffic plying on the Rhône between these two centers. A unique feature is a tunnel carrying the canal through a ridge which cuts off Marseilles from the interior (Percement du Tunnel de Rove, *La Nature*, March 4, 1916). The tunnel is remarkable for its size and length. It is 72 feet wide and 10 feet deep and is cut through the Chaine de la Nerthe a distance of four and a half miles. Land communication has also been improved by the construction of a new railroad line paralleling the coast westward from Marseilles to the north shore of the outlet of the Berre lagoon and thus connecting with the line to Arles (La nouvelle ligne ferrée de l'Estaque à Miramas (Marseille-Arles), *La Nature*, Feb. 12, 1916). The new line, besides facilitating the transport of troops and merchandise, will assure continuance of communication in the event of a block on the main line to Paris. Although such an accident does not appear probable, it must be borne in mind that the Paris-Mediterranean line pierces the Chaine de la Nerthe by a tunnel nearly three miles long and that the former sole alternative road, the line through Aix, suffers from the disadvantages of single track and steep gradients.

A Geographical Commission for Russian Poland. The German government has organized a "landeskundliche Kommission" for the study of the geography of Poland (*Geogr. Zeitschr.*, Feb., 1916). The area of investigation is practically that of the Kingdom of Poland as defined by the Congress of Vienna in 1815, or the Vistula provinces of Russian designation. The commission intends to publish a geographical handbook of Poland, based on the available literature and on the field investigations of its members. A series of detailed regional studies will also be published. The subjects represented by the members of the scientific staff, of which Dr. Max Friederichsen, professor of geography at the University of Greifswald, is director, are: structural and historical geology, glacial geology, geophysics, meteorology, and ethnology. In addition, several members of the civil administration will study the economic and commercial geography of the region, and the staff of the military meteorological service of the eastern front will contribute an account of the climatology.

Bulgarian and Turkish Mineral Resources. The participation of Bulgaria and Turkey in the war on the side of the Central Powers was welcomed in Germany on the ground of substantial economic advantages. The mineral resources of the two countries (Turkey is here practically synonymous with Asia Minor) are discussed in an article by Dr. Paul Krusch, of the Prussian Geological Survey, in the *Berliner Tageblatt's* weekly edition of December 29, 1915. According to this authority coal of all grades occurs both in Bulgaria and Turkey. In Bulgaria anthracite is found in the Balkan Range near Shipka Pass along the contact between the old eruptives and the limestones.

This form of coal is rare in Turkey. Both countries teem, however, with lignite beds. In Bulgaria they occur in the Cretaceous foreland between the Balkan Range and the Danube, in the central part of the Balkan Range itself, and in the Tertiary lacustrine deposits of intermont basins west of Sofia. In Turkey they are of widespread occurrence.

Iron, although known both in Bulgaria and Turkey, has not been worked extensively in either country. Explorations conducted on the site of reported discoveries appear to have yielded no startling results. Turkey is perhaps better favored as regards quantity, although its transportation facilities are totally inadequate for the handling of large tonnages. The importance of the countries as copper producers is greater, especially in the case of Turkey. Bulgaria's yield amounted to 1,650 tons of copper in 1911. Turkey's annual production of this metal attains approximately the same figure. The existence of a rich copper belt along the eastern shore of the Black Sea as well as in the basin of the upper Tigris is suspected. Both of these regions are thickly studded with ancient workings. The deposits of the Tigris region have been worked in a desultory fashion since the eleventh century.

Lead and zinc are not abundant in Bulgaria, but occur in Asia Minor in large deposits along the contact between the Tertiary eruptives and Carboniferous limestones. In general it may be said that of the two countries Turkey is by far the richer in mineral wealth. It is extremely doubtful, however, whether the Teutonic powers will be able to derive any advantage from this fact in the present war. Most of the Bulgarian and Turkish deposits require at least two years' development and the expenditure of adequate capital before being made to yield their treasures. Appreciable quantities cannot therefore be mined before the end of 1917, provided the work was started last fall. The gradual passing of Turkish territory into Russian hands will likewise prevent shipments of Turkish ore from reaching German or Austrian localities of consumption.

ASIA

The Turks in Asia. An echo of Constantinople "Panturkists" is found in an article by Professor Eugen Oberhummer of the University of Vienna in the *Geographische Zeitschrift* for February (Die Türken und das osmanische Reich, Vol. 22, 1916, pp. 52-87). According to this authority the number of Turks scattered over the vast Asiatic steppeland amounts to about 28,000,000. From the peninsula of Anatolia to western China a traveler speaking Turkish and proceeding north of the central mountain belt of Asia can generally make himself intelligible to the Tatar nomads on his path. Approximately 8,000,000 of these Turks dwell within Turkish official limits. The largest body—some 15,000,000—is found on Russian territory. Persia harbors 2,000,000. Approximately the same number reside in Khiva and Bokhara, while fully 1,000,000 live in China. All these Turks or Tatars speak the same form of Uralo-Altaic language. In Persia and Turkey the admixture of Arabian and Persian words in their language is large. North and east of Persia, however, the language flourishes in its primitive simplicity, free from foreign intrusions. It is interesting to note that in Turkey, where Turks are endeavoring to create feeling in favor of the union of Turkish-speaking peoples, the total number of Turks is placed at between 60,000,000 and 70,000,000. These excessive figures are obtained by including every tribe of Uralo-Altaic speech, practically all the Siberians, and the Mongols or kindred groups.

Racially the Turks belong to the broadheaded type of Central-Asian mobile peoples and are believed to be descended from the Mongols. The original type has disappeared in the course of their westerly expansion, owing to excessive intermixing with alien peoples. This can be seen today in Turkey, where the so-called Turk presents no physical difference from the conquered Christian populations. Indeed it is a characteristic of the Turk to resemble in appearance the peoples among whom he has settled. Thus the Turks of Armenia resemble Armenians, while on the Ionian coast they differ but slightly from the Greeks. But between the true Turk who has managed to preserve his Central-Asian individuality and the Tatar no difference can be found in language or race. The Turk of western Asia is the Tatar of central Asia or the Mongol of eastern Asia, to whom he is known as Ta-ta. The transition from the oblique to the normal eye as one proceeds westward from the Mongol's territory to the Anatolian tableland of the Turk is observable among the Tatars. As in eastern Europe the Turk is an intruder in western Asia.

Irrigation in the Punjab. The opening last December of the Upper Jhelum Canal completes the Punjab Triple Canal Project within the short time of ten years. It is estimated that the scheme will add not far short of two million acres of productive land to this already vastly important granary of the British Empire. According to the latest

official returns (Agricultural Statistics of India, 1912-1913, Vol. I, Calcutta, 1915) about 11,500,000 acres—half the total cultivated area—are dependent on irrigation, one-third from wells, two-thirds from the Government canals. Of this area 4,500,000 acres are under wheat. Irrigation thus accounts for rather more than half the total wheat acreage of the entire province, but the production from the irrigated lands is greatly superior; the ratio of yield for irrigated and non-irrigated being about 9:5.5. Specific references to the areas irrigated by the canals may be found in *Nature* (No. 2415, Vol. 96, 1916) and *United Empire* (N. S., Vol. 7, 1916, No. 2).

Operations of the Survey of India. The last report issued by the Survey of India covers operations undertaken from October 1, 1913, to September 30, 1914. Among the notable events of the period mention is made of the return of Captains Bailey and Morshead from six months' exploration in the eastern Himalayas. The work of both officers added greatly to our geographical knowledge of this region, besides clearing up all doubts as to the course of the Tsan-po, or Brahmaputra River (see "The Identity of the Sanpo and Dihang Rivers," *Bull. Amer. Geogr. Soc.*, Vol. 47, 1915, pp. 259-264.) The success of experiments to determine accurate differential longitudes by wireless telegraphy across the highest mountain ranges is also reported. These tests were conducted in the course of De Filippi's expedition to the Karakoram and in co-operation with the Survey's observatory at Dehra Dun. Differential longitudes between this station and points on the upper reaches of the Indus as far as Leh, on both sides of the Karakoram Pass, and in Chinese Turkestan were determined by the simultaneous recording of wireless telegraphic signals sent out by the Lahore radio office combined with astronomical observations. Additional exploration was carried on the North-East Frontier by Lieutenant Huddlestone. This officer accompanied a mission into the Aka country lying west of the country of the Abors and succeeded in making a reconnaissance survey of an area about 4,000 square miles in extent. This brings the total area surveyed since 1911 in the North-East Frontier Territory to about 49,000 square miles.

Siberian Traffic Problems. Although the traffic congestion at the port of Vladivostok is reported to be considerably relieved, private merchandise is still apt to suffer delay in transit, for 75 per cent of the available railroad freight space is reserved for Government use (*Commerce Repts.*, No. 67, Washington, 1916). A certain measure of relief is anticipated with the opening up of the navigation season on the Amur River, an event timed for the middle of June. The route thus available extends up the river for some 2,000 miles from Nikolayevsk at its mouth to Sryetensk on its left headwater branch, the Shilka, at the head of navigation for larger craft. Sryetensk is connected by a branch line with the main Trans-Siberian Railway and also with the Amur Railway. The latter, which is to provide an all-Russian rail route to the Pacific (the eastern end of the Trans-Siberian crosses Chinese territory), parallels the Amur on the north at some distance from the river as far as Khabarovsk, where rail connection with Vladivostok exists. Construction on the Amur Railway was begun in 1908 and has to date progressed as far as Blagovyeshchensk, a distance amounting to about 60 per cent of the total line to be built (Baedeker's Russia, 1914 edit., p. 539 and map facing p. 497). The traffic problems of the Siberian ports are closely related to those of our own Pacific ports. In this connection it is interesting to note that a new shipping agency has been established in Seattle operating a fleet of eight vessels chartered to sail between Puget Sound and Vladivostok (*Commerce Repts.*, No. 32, Washington, 1916).

WORLD AS A WHOLE AND LARGER PARTS

Early Hispano-Japanese Relations. A valuable bibliography of early Portuguese and Spanish contact with Japan by James A. Robertson is contained in the February, 1915, issue of the *Transactions of the Asiatic Society of Japan*. This intercourse centers chiefly around the great missionary movements which originated in the Iberian peninsula after the discovery of America. At the same time, the main purpose of Portuguese as of Spanish oversea activity was commercial.

In the middle of the sixteenth century, shortly after the accidental discovery of Japan by the Portuguese, there appeared to be reason to believe that Christianity was destined to spread rapidly in the islands. The Japanese *daimios* manifested eagerness to establish close trade relations with the west and made great show of friendliness towards Portuguese Jesuits and Spanish friars. The revulsion in feeling which took place at the end of the same century was due to the intolerance of the Christian missionaries no less than to a dawning conviction among the Japanese that the missionaries were merely disguised agents engaged in paving the way for the ultimate conquest of the land by

western sovereigns. The friendly relations which had marked the beginning of Hispano-Japanese intercourse gave place to ruthless persecution of Christian communities of converts by the islanders.

Considerable commercial rivalry also appears to have existed between the Japanese and the Spaniards with regard to the Philippine trade. Japanese junks found their way to the islands and carried traders who settled in Manila and other points to carry on their business. This apparently did not suit the Spaniards, and there was little mutual understanding between them and their eastern competitors.

HUMAN GEOGRAPHY

Man's Influence Upon the Earth. In the study of the reciprocal relations of man and earth the emphasis is placed rightly on the physical environment as affecting the activities of man. The effects of man on the earth, although universally recognized, have received but occasional systematic attention. The geologic texts of Lyell, Dana, and Chamberlin and Salisbury make brief mention of man as a physiographic and geologic agent. Recent suggestive articles on this topic have been written by A. Woeikof (De l'influence de l'homme sur la terre, *Ann. de Géogr.*, Vol. 10, 1901, pp. 97-114 and 193-215); C. P. Lucas (Man as a Geographical Agency, *Geogr. Journ.*, Vol. 44, 1914, pp. 479-492); and, most recently and most exhaustively, by Ernst Fischer (Der Mensch als geologischer Faktor, *Zeitschr. der Deutschen Geol. Gesell.: A. Abhandl.*, Vol. 67, 1915, pp. 106-148, listed in the Feb. *Review*, p. 168).

Fischer points out the fact that man is at present one of the leading agents in the direct modification of the earth's surface. He estimates the mass of material moved annually in the production of ores, mineral fuels, and salt at one cubic kilometer and would possibly double this figure for all mineral industry. To this amount are to be added the vast quantities of earth and rock moved in building and agricultural operations. Even more important is man's release or stimulation of physiographic forces, there being in general a great disproportion between the forces released and the energy expended by man in disturbing their equilibrium. The control of streams, the reduction of lake and swamp areas, the increased run-off, the decreased cover of vegetation, and, more especially, the rapid exploitation of the great ground-water reservoir represent, in the opinion of the author, the most extensive interference by man with the physiographic processes. The influence of man, as that of the other surficial agencies, is dominantly degradational, with occasional and minor aggradional activities.

Man is an important ecological factor, in other words, is modifying profoundly the paleontological record of the future. The adjustment of plant associations is being disturbed by the introduction of new species, by the clearing and cultivation of land, by fire, and other means resulting from the voluntary or involuntary meddling of man. Similar revolutionary changes are wrought in the animal world, especially among the larger animals and among numerous parasitic forms.

By his distribution through all climatic regions and his power to employ great physical forces man has become the guide fossil of the present geologic period. A consciousness of this geologic role of man is necessary for the continued well-being of future generations. Conservation therefore becomes a problem of geology, as well as geography.

CARL O. SAUER.

Blackwater Fever and a Specific for It. Wide publicity should be given the offer of Carlotta J. Maury (*Science*, March 10, 1916, p. 349) to submit for expert study a specimen of a plant from the interior of Venezuela which is used by the natives as a specific for the dreaded blackwater fever. Tropical lands not only present great climatic difficulties to the colonizer but also a number of unconquered diseases. Moreover the tropical lands of the western hemisphere are but thinly peopled in spite of great natural wealth. The lack of an adequate labor supply is the chief drawback to the exploitation of both soils and forests. When endemic diseases are conquered or measurably suppressed the present populations will be conserved and new or colonizing populations attracted. Every fact even suggesting a discovery in the field of tropical medicine should be thoroughly investigated. As soon as three or four unfilled temperate regions of the world are occupied the comparatively empty tropical lands of America will have a high potential value to the white race.

GEOGRAPHICAL NEWS

An American Historical Atlas. Satisfactory progress is reported on the proposed Atlas of the Historical Geography of the United States undertaken by the Department of Historical Research of the Carnegie Institution of Washington (*Year Book for 1915*,

pp. 177-178). The letterpress by Dr. Charles O. Paullin is in a fair way of completion, and maps in suitable form for execution by photolithography have been prepared from his sketches. The history of presidential elections will thus be cartographically illustrated.

Other sections of the work are also nearing achievement. A general physical map has been prepared by Professor R. H. Whitbeck of the University of Wisconsin, which is to be used as a base in the representation of economic features during various periods of American history. A chart showing oceanographic data related to American history has likewise been prepared by G. W. Littlehales of the Hydrographic Office.

Retirement of Professor Richard Elwood Dodge. Professor Richard Elwood Dodge, after twenty years' service as teacher of geography in Teachers College, Columbia University, has resigned his professorship, to devote himself uninterruptedly to those aspects of geography that interest him most, applied geography in the field of rural and especially agricultural education. Professor Dodge has gained a high place in educational geography. As the author of the "Dodge Geographies" and allied series, he has probably done more than any other man in the country in improving geographic education in elementary and particularly rural schools. We are too slow in this country in recognizing the value of this type of work as distinguished from "research." We must have research, but the fruits of research are withheld from the public unless the great memoirs are translated into common language. The geography of the average citizen is obtained from his grammar school text, not from memoirs which he almost never sees, much less reads.

It is a pleasure to announce at this time that Professor Dodge has been again appointed Editor of the Annals of the Association of American Geographers, a position which he held from 1911 to 1915. To this work he brings unusual experience. In 1897 he founded and edited the *Journal of School Geography*, which later became the *Journal of Geography*. In a list of the contributors to that journal would be found the names of most of the American geographers of the time; and the volumes contain a large body of geographic material that has permanent value.

Personal

Mrs. Harriet Chalmers Adams gave an illustrated lecture on Spain before the Geographical Society of Philadelphia on May 3.

Prof. Charles P. Berkey, of the department of geology of Columbia University, outlined the plans of the New York Academy of Sciences for field work in Porto Rico during 1916 before the Academy on May 15.

Prof. Eliot Blackwelder, of the department of geology of the University of Wisconsin, has been appointed professor of geology and head of the department at the University of Illinois. The appointment will take effect on September 1.

Mr. C. E. P. Brooks read a paper on February 16 before the Royal Meteorological Society of London on "The Rainfall of Nigeria and the Gold Coast." The paper dealt with the rainfall on the Guinea Coast and its hinterland for the ten years 1904-13.

President Nicholas Murray Butler of Columbia University, in his address on national unity before the Associated Press on April 25, touched upon geographic influences as illustrated by the tendency of a people to make its national domain coextensive with a well-defined natural unit. He is quoted as saying:

"A nation is scientifically defined as a population of an ethnic unity inhabiting a geographic unity under a common form of government. The exceptions are quite numerous enough to prove this rule. As the centuries have followed one another it is not difficult to see how the several nations have endeavored to possess themselves of territory that is a geographic unit. They have sought natural boundaries, whether of high mountains, or of broad rivers, or of the sea itself. One war after another is to be explained in terms of a nation's definite purpose to possess itself of a geographic unity as its home. There has been by no means equal care taken by the nations to establish and to protect an ethnic unity."

Prof. Henry E. Crampton, of Barnard College and the American Museum of Natural History, gave an illustrated lecture on "Kaieteur and Roraima: The Great Falls and the Great Mountain of Guiana" before the Appalachian Mountain Club of Boston on February 4.

Mr. W. C. Crandall, master of the *Alexander Agassiz*, the sea-going scientific col-

lecting vessel of the Scripps Institution for Biological Research at La Jolla, near San Diego, Cal., will give a course on "Local Coastal Physical Geography" at the "summer assembly in science" of the institution, which will be held from June 25 to August 15.

DR. CLIFFORD H. FARR spoke on "Jamaica and Its Plants" before the Torrey Botanical Club on May 9.

DR. CRISTOBAL HICKEN read a paper on January 22 at the annual meeting of the Society of American Foresters in Washington, D. C., on "Vegetation Zones of Argentina and Adjoining Regions."

MR. E. T. HODGE spoke on May 15 before the New York Academy of Sciences on the "Geology of the Coamo-Guayama Region, Porto Rico."

MR. J. W. JACKSON spoke on February 8 before the Literary and Philosophical Society of Manchester, England, on "The Geographical Distribution of the Shell-Purple Industry." The paper dealt with the production of purple dye by the Phoenicians and its spread to eastern Asia and Central America.

PROF. DOUGLAS W. JOHNSON of Columbia University addressed the members of the Geographical Society of Philadelphia on "Geographical Features of the Russian Retreat" at their annual luncheon on April 29. At the request of Major-General Leonard Wood, Professor Johnson will discuss the influence of topography on the European war at the military camps at Plattsburg during the coming summer.

SIR DOUGLAS MAWSON sailed on May 2 from New York for England on the *S.S. Orduna*. He had arrived from Australia the day before and was on his way to London to take up duties assigned to him in the War Office.

DR. GEORGE E. NICHOLS, assistant professor of botany in Yale University, gave an illustrated lecture on April 15 before the Biological Club of Mount Holyoke College on the "Plant Societies of Connecticut."

DR. ERLAND NORDENSKIÖLD'S collection of ethnographical specimens, made on his recent expedition in the boundary districts of Bolivia and Brazil, referred to in the April *Review* (p. 308), have safely reached the museum in Göteborg. For a time fears were entertained as to their safety, as it was thought they might have been lost when the German cruiser *Karlsruhe* sank (*Zeitschr. fur Ethnologie*, 1915, No. 4-5, pp. 322-323).

MR. W. J. PERRY spoke on February 8 before the Literary and Philosophical Society of Manchester, England, on "The Geographical Distribution of Terraced Cultivation and Irrigation."

MR. D. R. SEMMES spoke on May 15 before the New York Academy of Sciences on the "Geology of the San Juan District, Porto Rico."

SIR NAPIER SHAW presented a paper before the Royal Meteorological Society of London on March 15 on "The Meteorology of the Globe in 1911." The paper dealt with the material in the first of a series of annual meteorological summaries for the world about to be published by the London Meteorological Office. The volume for 1911 will give, besides other information, particulars of pressure, temperature, and rainfall for available stations in all parts of the globe at the rate of two stations for each ten-degree square.

DR. J. R. SUTTON read a paper on February 16 before the Royal Meteorological Society of London on "South African Coast Temperatures." This paper dealt with the normal monthly mean temperatures at selected stations on the coast of South Africa, a few miles inland, and on the tableland.

DR. ERICH WUNDERLICH, assistant in the department of geography at the University of Berlin and one of the junior members of the Society's Transcontinental Excursion of 1912, has been appointed geographer to the "Landeskundliche Kommission" organized by the German government for the study of Russian Poland, to which reference is made on page 459. Doctor Wunderlich will devote himself especially to the glacial geology of the region.

OBITUARY

DR. CHARLES A. DAVIS died on April 9, aged 55. He was widely known as a peat expert. In this capacity he served the U. S. Geological Survey from 1907 to 1910 and the Bureau of Mines from 1910 to 1912, at which date his title was changed to fuel technologist. Davis' two most important contributions to the subject are: "Peat: Essays

on Its Origin, Uses, and Distribution in Michigan'' (*Michigan Geol. Surv. Rept. for 1906*, pp. 93-395) and ''The Uses of Peat for Fuel and Other Purposes'' (214 pp., *U. S. Bureau of Mines Bull. 16*, 1911). He was a member of the Association of American Geographers.

DR. FRITZ REGEL, professor of geography at the University of Würzburg, died at that city on December 2, 1915, aged 62. Prior to his connection with this institution, from 1884 to 1909, he had represented geography at the University of Jena, first as instructor, then as associate professor. To this period belong his publications on Thuringia, his native district: ''Die Entwickelung der Ortschaften im Thüringerwald,'' *Ergänzungsheft zu Petermanns Mitt. No. 76*, 1884; ''Thüringen: Ein geographisches Handbuch,'' 3 vols., Jena, 1892-96; ''Thüringen, ein landeskundlicher Grundriss,'' Jena, 1897. In 1896-97 Regel made a trip to South America to study the Colombian Andes. On his return he published a monograph on the geography of Colombia (in series *Bibliothek der Länderkunde*, Berlin, 1899) and contributed the section on this country to Mill's ''International Geography.'' Another helpful regional geography is his ''Landeskunde der Iberischen Halbinsel'' (*Sammlung Göschen No. 235*, Leipzig, 1905). His later publications deal mainly with commercial geography and countries of economic interest. He wrote a manual entitled ''Handelsgeographie'' (6th edit., Stuttgart, 1912, reviewed in *Bull. Amer. Geogr. Soc.*, Vol. 46, 1914, p. 862) and contributed the section on Latin America to ''Karl Andree's Geographie des Welthandels,'' (Vol. 3, Frankfurt, 1913) and Scobel's ''Geographisches Handbuch'' (Leipzig, 1910), also on western, northern, and eastern Europe in the latter. A publication on the Panama Canal (series *Angewandte Geographie*, 1909, reviewed in *Bull. Amer. Geogr. Soc.*, Vol. 44, 1909, p. 187) is of interest because of its geographical treatment of the topic.

GEOGRAPHICAL PUBLICATIONS

(Reviews and Titles of Books, Papers, and Maps)

For key to classification see "Explanatory Note" in the January number, pp. 57-61

NORTH AMERICA

ALASKA

PILDER, HANS. **Die Russisch-Amerikanische Handels-Kompanie bis 1825.** 174 pp. (Series: Osteuropäische Forschungen, im Auftrag der Deutschen Gesellschaft zum Studium Russlands herausgegeben von Otto Hoetzsch, Otto Auhagen, Erich Berneker.) G. J. Göschen, Berlin and Leipzig, 1914. M. 4.80. 9½ x 6½.

As most of the publications and practically all the original documents relating to the Russian-American Company are in Russian, they are accessible to relatively few students. Doctor Pilder has, therefore, performed a valuable service by compiling from Russian and other sources a large amount of information about the early history of the great corporation which controlled Alaska for over sixty years.

Yet this work cannot be considered an exhaustive treatise, for the sources of information are largely secondary. The American reader will here find little not already set forth in H. H. Bancroft's "History of Alaska." In fact, the close parallelism between a part of Doctor Pilder's text and that of Bancroft's work, to which he makes no reference, plainly indicates that both treatises are based on the same Russian authorities. In the interest of historical accuracy it would appear that the author has placed altogether too much reliance on Chlebinikof's biography of Baranof.

The geography in this volume leaves much to be desired and indicates that no use of maps was made in its preparation. Among the more glaring errors is the calling of the St. Elias Range the Rocky Mountains. Three Saints Bay at the southern end of Kodiak Island is confused with St. Paul Harbor at the northern end. The Commander Islands are called the Kurile Islands, and Chirikof, instead of Bering, is credited with their discovery. The locality of the landfalls of both Chirikof and Bering on the Alaska coast in 1741 is wrongly given.

As Doctor Pilder uses the old Russian geographic nomenclature, it is difficult to follow the text on modern maps. Few readers will recognize Kenai Sound as Cook Inlet, or, still less, Chugach Sound as Prince William Sound. Even in this he is not entirely consistent, for the old Russian settlement of New Archangel is referred to under its modern name of Sitka. The translation of English names into Russian and thence into German has metamorphosed Shields into "Schilz," Davis into "Dewis," Meek into "Mik," and O'Cain into "Okein."

The appendix contains some valuable translations of Russian documents relating to the history of the colony. ALFRED H. BROOKS.

Channel Islands to Cordoba, Orca Bay and Inlet, Prince William Sound, Alaska. 1:30,000. Chart No. 8525, U. S. Coast & Geodetic Survey, Washington. Edit. of Jan., 1916. Price, 30 cents.

Kuskokwim Bay, west coast of Alaska. 1:200,000. Chart No. 9103, U. S. Coast & Geodetic Survey, Washington. Edit. of March, 1915. Price, 50 cents.

Eek Island to Bethel, Kuskokwim River, west coast of Alaska. 1:100,000. Chart No. 9104, U. S. Coast & Geodetic Survey, Washington. Edit. of March, 1915. Price, 30 cents.

Cape Resurrection to McArthur Pass, Alaska. 1:80,000. Chart No. 8527, U. S. Coast & Geodetic Survey, Washington. Edit. of July, 1915. Price, 50 cents.

Ulloa Channel of San Christoval Channel, west coast of Prince of Wales Island, southeast Alaska. 1:40,000. Chart No. 8155, U. S. Coast & Geodetic Survey, Washington. Edit. of Dec., 1915. Price, 50 cents.

CANADA

General

ABBOTT, F. H. **The Administration of Indian Affairs in Canada.** Ills., index. 148 pp. Board of Indian Commissioners, Washington, D. C., 1915.

ADAMS, F. D. **Our Mineral Resources and the Problem of Their Proper**

Conservation. *Rept. of the 6th Annual Meeting, Commission of Conservation,* pp. 52-69. Bryant Press, Ltd., Toronto, [1915].

—— **Canada as a Resort for the Tourist: The Dominion's Three Transcontinental Railways That Have Opened Vast Regions for the Delight of the Sightseer and the Profit of the Pioneer.** Ills. *Dun's Rev.: Internatl. Edit.,* Vol. 27, 1916-17, No. 2, pp. 45-48. New York.

—— **Canada Year Book, The: 1914. Published by authority of the Minister of Trade and Commerce.** xvi and 698 pp. Maps, ills., index. J. de L. Taché, Ottawa, 1915. 9 x 6. [Official handbook compiled in the Census and Statistics Office. Contains data on physical features, climate, economic conditions, and population of Canada. Special features this year are the articles on geology in relation to agriculture in Canada, by Wyatt Malcolm, and a general survey of the climate of Canada, by R. F. Stupart. A list is given of the principal publications of the Dominion and provincial governments.]

—— **Conservation, Commission of: Report of the Sixth Annual Meeting Held at Ottawa, January 19-20, 1915.** 333 pp. Map, ills., index. Bryant Press, Ltd., Toronto. [Includes reports on the conservation of forest, fur and fish, mineral and water-power resources and the report of the agricultural survey work carried on by the Commission.]

COPPING, A. E. **Canada To-Day and To-Morrow.** 275 pp. Maps, ills., index. Cassell & Co., London, 1911. $2.50. 8 x 5½.

DONNELL, ALLAN. **The Canadian Fresh Sea Fish Trade.** Ills. *Rept. of the 6th Annual Meeting, Commission of Conservation,* pp. 180-184. Bryant Press, Ltd., Toronto; [1915]. [See also note on "Canadian Fisheries, 1914-15" in the February number, p. 141.]

HAANEL, EUGENE. **The Utilization of Some of Our Non-Metallic Mineral Resources Suggested by Present Conditions.** *Rept. of the 6th Annual Meeting, Commission of Conservation,* pp. 34-51. Bryant Press, Ltd., Toronto, [1915].

—— **Irrigation, Report on, for 1914.** 222 pp. Maps, ills., index. *Dept. of the Interior Ann. Rept. 1914,* Part 7. Ottawa, 1915.

KLOTZ, OTTO. **Seismology, Terrestrial Magnetism, and Gravity.** Maps, diagrs., ills. *Rept. of the Chief Astronomer 1911,* pp. 5-92. Dept. of the Interior, Ottawa, 1915.

LAUREYS, HENRI. **Les métaux précieux du Canada.** Diagrs., ills. *Bull. de la Société de Géogr. de Québec,* Vol. 9, 1915, No. 6, pp. 323-334.

STUPART, R. F. **Report of the Meteorological Service of Canada for the Year Ended December 31, 1912.** Vol. 1: Introduction and Parts 1-3, xvi and 367 pp. Vol. 2: Parts 4-6, pp. 370-568. Dept. of Marine and Fisheries, Toronto, 1915.

THORNHILL, J. B. **Colonization Within the Empire: Canada Generally and the Coastal Belt of British Columbia in Particular.** *United Empire,* Vol. 6, 1915, No. 10, pp. 742-747.

—— **Water Powers of Canada: Notes on the Natural Resources and Some of the Developments.** Ills. *Sci. Amer. Suppl.,* No. 2090, Vol. 81, 1916, Jan. 22, pp. 56-57.

WHITE, A. V. **Water and Water-Power Problems.** Ills. *Rept. of the 6th Annual Meeting, Commission of Conservation,* pp. 136-151. Bryant Press, Ltd., Toronto, [1915].

UNITED STATES

South Atlantic States

CANBY, H. S. **Top O' Smoky.** Ills. *Harper's Mag.,* No. 790, Vol. 132, 1916, March, pp. 573-583. [Valley and cove people of the Southern Appalachians.]

FASSIG, O. L. **A Remarkable Fall of Hail in Maryland.** Maps, ills. *Monthly Weather Rev.,* Vol. 43, 1915, No. 9, pp. 446-448. [Abstracted in the May *Review,* p. 372.]

HENNEN, R. V., AND R. M. GAWTHROP. **Wyoming and McDowell Counties.** xxvii and 783 pp. Maps, diagrs., ills., index; also maps in separate case. *West Virginia Geol. Surv. County Repts.* Wheeling, 1915. [Important report on the geology of the two adjoining counties in the southernmost part of the state in which the Pocahontas and New River coal groups attain their maximum development. A chapter each is devoted to the historical and industrial development of the region (18 pp.), to its physiography (14 pp.), and its structure (15 pp.). There are three chapters (513 pp.) on the mineral resources, the longest (475 pp.) being devoted to coal. A topographic map, 1:62,500 (relief in 50-foot contours, based on the U. S. Geological Survey map,

with corrections and additions by the author) and an original geologic map on the same scale accompany the report.]

KREBS, C. E., AND D. D. TEETS, JR. **Cabell, Wayne, and Lincoln Counties.** xvi and 483 pp. Maps, diagr., ills., index; also maps in separate case. *West Virginia Geol. Surv. County Repts.* Wheeling, 1913. [Important report on the natural resources of these westernmost counties, lying within the angle formed by the junction of the Big Sandy with the Ohio. There are chapters on the historical and industrial development (22 pp.), the physiography (11 pp.), the general geology (47 pp.), petroleum and natural gas (108 pp.), coal (20 pp.), other mineral resources (10 pp.), timber (5 pp.), and soils (134 pp.), and a list of elevations (16 pp.). Of each county there are three maps, 1:62,500, representing (1) topography, (2) general and economic geology, and (3) soils. The first is based on the U. S. Geological Survey, the second is original, and the third is reprinted from a soil survey undertaken in co-operation with the state by the Bureau of Soils of the U. S. Department of Agriculture.]

REGER, D. B. **Lewis and Gilmer Counties.** xx and 660 pp. Map, ills., index; also maps in separate case. *West Virginia Geol. Surv. County Repts.* Wheeling, 1916. [Similar in scope to report by Hennen and Gawthrop, listed above. To these central counties are devoted chapters on historical and industrial development (20 pp), physiography (12 pp.), structure (11 pp.), petroleum and natural gas (326 pp.), coal (98 pp.), and other mineral resources (18 pp.). A topographic map, 1:62,500, based on the U. S. Geological Survey (20-foot and 50-foot contours) and an original formational and economic geologic map, 1:65,000, accompany the report.]

Neuse River and upper part of Bay River, North Carolina. 1:40,000. Chart No. 538, U. S. Coast & Geodetic Survey, Washington. Edit. of Feb., 1915. Price, 50 cents.

Portsmouth Island to Beaufort, including Cape Lookout Shoals, North Carolina. 1:80,000. Chart No. 1233, U. S. Coast & Geodetic Survey, Washington. Edit. of June, 1915. Price, 50 cents.

Tampa Bay to Cape San Blas, Florida. 1:450,000. Chart No. 1114, U. S. Coast & Geodetic Survey, Washington. Edit. of Oct., 1915. Price, 50 cents.

Western States

LEWIS, A. D. **Irrigation and Settlement in America.** 258 pp. Maps, diagrs., ills. The Government Printing and Stationery Office, Pretoria, 1915. 11 x 9.

The discovery of America by people from abroad is still going on and with increasing value to the world. Interest is not limited to purely geographical features, but the most important observations are those which pertain to the use being made of the opportunities offered by nature and of the methods employed in overcoming natural difficulties. The more recently settled or newer parts of the country in particular afford useful examples to citizens and officers of other new countries. An increasing number of visitors are coming from Australia, South Africa, and the drier parts of the world to see for themselves how the Americans have handled the problem of irrigation of arid lands.

An example of this semi-scientific or technical exploration is afforded by the present book, whose author is an engineer of the Irrigation Department of the Union of South Africa and was formerly connected with the Public Works Department in the Punjab, India. It is peculiarly interesting to Americans, and to engineers in particular, to see how their achievements are viewed through foreign eyes. In the present instance the description is confined largely to relatively superficial matters and to a compilation of statements and data printed in numerous reports. The chief value of the book to American readers is in bringing together in accessible form the principal facts concerning some of the larger irrigation enterprises in the western part of the United States. In his three months' visit the author obtained only a general view and could not fully appreciate American achievements in surmounting great obstacles interposed not merely by nature but by economic and financial conditions. He has not attempted to go far beyond the description of the things seen at the time he visited the country.

The chief danger of a book of this kind may be a tendency on the part of the people in other countries to copy some of the methods or institutions which have been developed in the West without appreciating that many of these are undesirable and should be considered as warnings rather than as desirable precedents. For instance, in describing state control of irrigation development it is pointed out that there are certain state commissions which under existing laws are supposed to safeguard the interests of all the people, notably of the investors in irrigation works and of the settlers under them. There is not pointed out, however, the even more important fact that the

ex-officio state boards have been lamentably ineffective because of the fact that the men constituting the boards have been overloaded with official duties, thus preventing them from giving adequate time and thought to a business which in itself is extremely difficult. Moreover these officials are changed before they have time to study the problems and, being selected wholly for political reasons, have usually little or no interest in the complicated matters.

It does not appear also that practically all large private irrigation projects have been financially unsuccessful, and that great hardships and suffering have resulted not only to the settlers under many of these, but also to the small investors who have been induced to buy the stocks and bonds of irrigation companies. It is true that such a conclusion has naturally no very large place in a discussion of topographical and engineering features; but at the same time in a book of this kind a warning note should be sounded.

It is now being appreciated as never before that it is the duty of the engineer not merely to plan and build effectively and economically but, more than this, to see to it that the works which he is planning can be usefully employed after he has finished them. No matter how great wisdom may be shown in overcoming difficulties, the engineer will not receive proper recognition, but rather the reverse, if it happens that the results of his work lead to loss and hardship on the part of large numbers of people.

Taking the description as a whole, it has value as above stated in affording a broad review of some of the larger irrigation works of the country. In particular the pictures are excellent, but the maps and drawings are not up to the standard of the rest of the book, notably in the use of the old-fashioned "caterpillar" form of representing mountains. The failure to arrange the maps with the north at the top of the page leads to some difficulty in orientation. The omission of an index in a book of this kind is to be condemned.

F. H. NEWELL.

GERRY, C. N. **Gold, Silver, Copper, Lead, and Zinc in Idaho and Washington in 1914: Mines Report.** Bibliogr. *Mineral Resources of the U. S., 1914*, Part I, pp. v and 597-654. U. S. Geol. Surv., Washington, 1915.

GIFFORD, E. W. **Composition of California Shellmounds.** Map. *Univ. of California Publs. in Amer. Archæology and Ethnology*, Vol. 12, 1916, No. 1, pp. 1-29.

GREGORY, H. E. **The Oasis of Tuba, Arizona.** Maps, diagr., ills. *Annals Assoc. Amer. Geogrs.*, Vol. 5, 1915, pp. 107-119. [Abstracted in the May number, pp. 371-372. For the general background of this paper see the same author's "The Navajo Country," *Bull. Amer. Geogr. Soc.*, Vol. 47, 1915, pp. 561-577 and 652-672.]

HEIKES, V. C. **Gold, Silver, Copper, Lead, and Zinc in Arizona in 1914: Mines Report.** Bibliogr. *Mineral Resources of the U. S., 1914*, Part I, pp. v and 757-797. U. S. Geol. Surv., Washington, 1915.

HEIKES, V. C. **Gold, Silver, Copper, Lead, and Zinc in Montana in 1914: Mines Report.** Bibliogr. *Mineral Resources of the U. S., 1914*, Part I, pp. v and 757-797. U. S. Geol. Surv., Washington, 1915.

HEIKES, V. C. **Gold, Silver, Copper, Lead, and Zinc in Nevada in 1914: Mines Report.** Bibliogr. *Mineral Resources of the U. S., 1914*, Part I, pp. v and 655-716. U. S. Geol. Surv., Washington, 1915.

HEIKES, V. C. **Gold, Silver, Copper, Lead, and Zinc in Utah in 1914: Mines Report.** Bibliogr. *Mineral Resources of the U. S., 1914*, Part I, pp. v and 717-756. U. S. Geol. Surv., Washington, 1915.

KELLOGG, LOUISE. **Report upon Mammals and Birds Found in Portions of Trinity, Siskiyou, and Shasta Countries, California, with Description of a New *Dipodomys*.** Map, ills, bibliogr. *Univ. of California Publs. in Zoölogy*, Vol. 12, 1916, No. 13, pp. 335-398. [Studies in faunal distribution.]

—— **Los Angeles, January Rainfall in Mountains Near.** *Engineering News*, Vol. 75, 1916, No. 10, p. 461.

MANSFIELD, G. R. **A Reconnaissance for Phosphate in the Salt River Range, Wyoming.** Map. *U. S. Geol. Surv. Bull. 620–O*, pp. 331-349. Washington, 1916.

MCARTHUR, L. A. **Topographic Mapping in the Pacific Northwest.** *Mazama*, Vol. 4, 1915, No. 4, pp. 70-71. Portland, Ore.

—— **Mountain Elevations [in the Pacific Northwest].** *Mazama*, Vol. 4, 1915, No. 4, p. 72. Portland, Ore.

—— **Sacramento River, Propose to Improve the.** *Engineering Rec.*, Vol. 73, 1916, No. 10, p. 323.

SUDWORTH, G. B. **The Spruce and Balsam Fir Trees of the Rocky Mountain Region.** 43 pp. Maps, ills. *U. S. Dept. of Agric. Bull. No. 327.* Washington, 1916. [The geographic distribution of the principal species is shown in a series of maps. For the method of compilation and discussion see also *Dept. of Agric. Bull. No. 207*, 1915.]

THIESSEN, A. H. **The Weather and Climate of Salt Lake City, Utah.** *Monthly Weather Rev.*, Vol. 43, 1915, No. 12, pp. 611-612. [Author's abstract of a paper read at the Pan American Scientific Congress in Washington, Dec., 1915-Jan., 1916.]

Roslyn-Clealum Coal Field, Kittitas County. 1:253,440. Accompanies "The Coal Fields of Kittitas County" by E. J. Saunders, *Wash. Geol. Surv. Bull. No. 9*, Olympia, 1914.

Entrance to Harrington Point, Columbia River, west coast of United States. 1:40,000. Chart No. 6151, U. S. Coast & Geodetic Survey, Washington. Edit. of March, 1915. Price, 50 cents.

Point Sur to San Francisco, California. 1:210,000. Chart No. 5402, U. S. Coast & Geodetic Survey, Washington. Edit. of Feb., 1915. Price, 50 cents.

SOUTH AMERICA

PARAGUAY, URUGUAY, ARGENTINA, CHILE

DAVIS, W. G. **Clima de Buenos Aires.** *Anales de la Ofic. Meteorológ. Argentina*, Vol. 15. Part 1: 763 pp.; Part 2, 458 pp. Buenos Aires, 1912.

The weight of the first two parts of Volume 15 of the *Annals* of the Argentine Meteorological Office is 9 pounds and 14 ounces. And there is still a third part to come. Of the more than 1,200 pages, all but about 25 pages are tabular matter. These 25 pages are the administrative reports for 1898 and 1899. Complete as is this presentation of the meteorological data of Buenos Aires, no one can handle these two heavy volumes without asking himself, "Why were they ever printed?" That the climate of a single city should have devoted to it nearly ten pounds' weight of paper surely is evidence of the immense numbers of observations which have been taken there, but that there can ever be any scientific use of this data which will be at all proportionate to the expense of publication is inconceivable. Observations prior to 1877 were published in Volume 1 of the *Annals*. The present volume contains the data, *in extenso*, for the several stations in Buenos Aires for varying periods from 1877 on. A note, dated March, 1915, and bearing the signature of the former Director, Mr. Walter G. Davis, calls attention to the fact that these two first parts of Volume 15 have been ready for some time but were not distributed in the hope that the third part, which is to contain the discussion, might be sent out with them. We have no doubt that this remaining third part of the volume, which will be awaited with interest, will be a full and adequate presentation of all that concerns the climate of Argentina's capital city, well up to the high standard of the past volumes of the Argentine Meteorological Office. (For a note on the Service's activities see the April *Review*, p. 301.) R. DEC. WARD.

—— **Argentina: Raccolta di cereali.** *Rapp. dei Agenti Diplom. e Consol.*, No. 23, Dec. 1915, p. 1. Minist. degli Affari Esteri, Rome.

BAZZANO, HAMLET. **National Meteorological Institute of Uruguay.** *Monthly Weather Rev.*, Vol. 43, 1915, No. 12, p. 607. [Author's abstract of a paper read at the Pan American Scientific Congress in Washington, Dec., 1915-Jan., 1916.]

—— **Chile, Anuario Estadístico de la República de: Vol. 1, Demografía, año 1913.** xxxi and 119 pp. Oficina Central de Estadística, Santiago de Chile, 1914.

CUMMINGS, R. K. **The Land of Fire.** Ills. *The South American*, Vol. 4, 1916, No. 3, pp. 55 and 62. New York. [Tierra del Fuego.]

DAWSON, WILLIAM, JR. **Rosario.** 6 pp. *Suppl. to Commerce Repts.*, Ann. Series, 1915, No. 38c. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

GALLO, H. V. **Reseña sobre los trabajos en el mineral de El Tofo.** *Bol. Soc. Nacional de Minería*, 3rd Series, No. 219, Vol. 27, 1915, pp. 434-439. Santiago, Chile. [The famous iron mines in Coquimbo province, Chile.]

GOEHRING, MAURIZIO. **Il Paraguay.** Ills. *L'Esplorazione Commerc.*, Vol. 30, 1915, No. 1, pp. 1-8; No. 2, pp. 45-53; No. 3, pp. 105-114; No. 4, pp. 121-133; No. 5, pp. 176-188; No. 6, pp. 216-226; No. 7, pp. 256-268; No. 10-11, pp. 380-394; and No. 12, pp. 445-448. Milan.

ILLANES B., GUILLERMO. **Mineral de Chuquicamata, de la Chile Exploration Company.** Diagr., ills. *Bol. de la Inspección de Geogr. y Minas*, No. 46, Vol. 11, 1915,

pp. 236-270. Dirección General de Obras Públicas, Santiago. [Method of exploitation. See also note on "The Celebrated Copper Mines of Chuquicamata, Chile" in *Bull. Amer. Geogr. Soc.*, Vol. 47, 1915, p. 693.]

MATTA, J. G. **Bosquejo del estado actual de la industria minera del cobre en el estranjero i en Chile.** Diagrs. *Bol. Soc. Nacional de Minería*, 3rd Series, No. 216, Vol. 27, 1915, pp. 118-138; No. 217, pp. 178-204; No. 218, pp. 319-354; No. 219, pp. 357-419. Santiago, Chile.

MATTA, J. G. **Critica de las opiniones sustentadas por el señor Santiago Marin Vicuña sobre nacionalización de nuestra industria minera.** *Bol. Soc. Nacion. de Minería*, 3rd Series, No. 220, Vol. 27, 1915, pp. 445-463. Santiago, Chile. [Advocates of the nationalization of the Chilean mineral industry have compared conditions with those obtaining in Sweden. The comparison is here criticized.]

OPAZO, G. R. **Los problemas de regardío: Monografía de las principales represas construídas en el país.** *Bol. de la Inspección de Geogr. y Minas*, No. 46, Vol. 9, 1915, pp. 271-283. Dirección General de Obras Públicas, Santiago. [On principal irrigation works of Chile.]

PUELMA, M. **Memoria anual del Cónsul General de Chile en la República Argentina correspondiente a 1914.** *Bol. de Relaciones Exteriores*, No. 58, July, 1915, pp. 1-54. Santiago, Chile.

SILVA, J. F. V. **La desmembración del territorio argentino en el siglo XIX.** *Bol. Real Soc. Geogr.*, Vol. 57, 1915, No. 4, pp. 474-514. Madrid. [Given in the form of a lecture at the public session on December 3, 1914.]

SINGEWALD, J. T., JR., AND B. LER. MILLER. **A Unique Salt Industry in Chile.** Diagrs., ills. *Bull. Pan American Union*, Vol. 42, 1916, No. 1, pp. 52-60. [Nearness of ground-water level to the surface permits easy extraction of salt on such salars as that of Lagunas, Tarapacá. The salt crystallizes out naturally from ditches cut 8 inches below the water table.]

Mapa de las tribus de los Chacos. 1:3,000,000. Accompanies "El Choroti o Yófuaha" by R. J. Hunt, *Rev. del Museo de la Plata*, H. Young & Sons, Ltd., Liverpool, 1915.

EUROPE

GENERAL

CASSI, GELLIO. **Il Mare Adriatico: Sua funzione attraverso i tempi.** (Series: Collezione Storica Villari.) xix and 532 pp. Maps. Ulrico Hoepli, Milan, 1915. L. 5.50. 7½ x 5.

Written in an earnest spirit, this account of the part played by the Adriatic in world history pictures clearly the problems related to this inland sea. The lustre shed by the region during the period of Roman greatness and in the medieval days of successful commercial venture is imperishable. The author holds that the Adriatic is an Italian sea. Members of the numerically preponderant Slav communities of the eastern coast would probably take exception to this view, in spite of the cultural inferiority of their kinsmen when compared with Romans or Italians. The case of these Slavs deserves perhaps greater consideration than the Austrian attempts to convert the Adriatic into a pendant of the Teuton heart of Europe—a process which the author describes as artificial. The policy of pitting Slavs against Italians has been resorted to by the German-speaking rulers of the eastren coast to weaken Italian influence. Accordingly, local grievances as well as local aspirations can best be satisfied by the removal of Austrian rule.

The historical value of the work is heightened by the relation, so frequently shown, of the region's history to its geographical structure.

CRAM, R. A. **Heart of Europe.** 325 pp. Ills. Charles Scribner's Sons, New York, 1915. $2.50. 8½ x 6. ["Between the Seine and the Rhine."]

GREGORY, J. W. **Geological Factors Affecting the Strategy of the War.** *Geol. Mag.*, Decade 6, Vol. 2, 1915, No. 12, pp. 571-572. [Abstract of a presidential address before the Geological Society of Glasgow on Oct. 14, 1915.]

SEMPLE, E. C. **The Barrier Boundary of the Mediterranean Basin and Its Northern Breaches as Factors in History.** *Annals Assoc. Amer. Geogrs.*, Vol. 5, 1915, pp. 27-59. [Abstracted in the March *Review*, p. 220.]

Battle Fields of Today. 16 pages of maps. Rand, McNally & Co., Chicago, 1915. 14 x 10.

On the battle lines [9 maps]. Rand, McNally & Co., Chicago, [1915]. 7½ x 6.

Atlas of the European Conflict, containing [13] detailed maps of the nations [and] pertinent statistics of the contending powers. Rand, McNally & Co., Chicago, 1914. 14 x 10½.

L'Atlas-index de tous les théatres de la guerre: *Ibis*, France et Belgique, avec cartes détaillées du front. 17 pp. of text, 24 maps, and 41 pp. index. Berger-Levrault, Paris, 1915. 8 x 6.

Carte murale du théâtre de la guerre, par L. Gallois. (Collection de cartes murales Vidal-Lablache.) 1:600,000. Armand Colin, Paris, [1915].

Carte murale du théâtre de la guerre européenne, par P. Vidal-Lablache. 1:1,500,000. Armand Colin, Paris, [1915].

Das italienisch-österreichische Grenzgebiet. 1:1,000,000. Inset: Das Küstengebiet des Adriatischen Meeres, 1:2,750,000. Wagner & Debes, Leipzig, [1915].

GERMANY

OTTO, THEODOR. **Der Darss und Zingst: Ein Beitrag zur Entwicklungsgeschichte der vorpommerschen Küste.** Map, diagrs., ills. *Jahresbericht der Geogr. Gesell. zu Greifswald*, Vol. 13, 1911-12, pp. 235-485. Greifswald, 1913.

The peninsula of the Darss on the Baltic coast of Germany includes one of the world's best examples of a cuspate foreland of somewhat complicated type. Several

FIG. 1—Forested dune ridges on the Darss foreland. (Photo by D. W. Johnson.)

low islands, bordering an irregular shoreline of submergence, were early united by wave-built bars to form a complex tombolo, from the northwestern side of which the present foreland was prograded by the successive addition of parallel beach ridges. Dune sand later accumulated on each beach ridge, raising many of them to an altitude of fifteen feet or more above the intervening swales. The ridges are now well forested (see Fig. 1), and a large portion of the foreland is included in a private hunting preserve of Prinz Eitel Friedrich.

The dune ridges of the Darss closely resemble those of Cape Canaveral and are of more than ordinary interest to the geographer. The present excellent essay by Theodor Otto is based upon a comparative study of ancient and modern maps and upon detailed field investigations; and the author discusses at length the preglacial conditions of the region involved, the effects of glaciation and of preglacial changes of level upon the

coastal topography; and finally the more recent morphological changes of the coast, including the development of the dune ridges. It appears from Otto's essay that there are 121 dune ridges distinguishable in passing from south to north along the western side of the Darss, only a part of which number are indicated on the German topographic map of the area (Karte des Deutschen Reiches, 1:100,000, Sheet No. 62, Barth). Historical evidence proves that the coast advanced 1,300 feet in 2,000 years. Using this figure as a basis for calculation, Otto concludes that 3,000 years is the shortest possible time in which the 121 ridges could have been constructed. 1,000 additional years are allowed for the formation and subsequent destruction of certain older ridges near the base of the foreland; and Otto thus concludes that a total of at least 4,000 years was required for the development of the ridged foreland. It may be noted that Keilhack, in a study of the dune ridges of Usedom and Wollin (Die Verlandung der Swinepforte, *Jahrbuch der Kgl. Preussischen Geol. Landesanstalt für 1911* (Vol. 32, pp. 209-244, 1912), estimated 7,000 years as the time necessary for the development of that remarkable series. As both series of ridges are believed to have been initiated by the submergence known as the "Litorinasenkung," it would seem that the present shoreline of submergence dates back from four to seven thousand years. Since that time there has been no marked change in the level of land and sea along the Baltic coast of Germany, as otherwise the older ridges would be either submerged or raised well above the level of those last formed.

The reader will have some difficulty in following Otto's arguments because he locates important features and describes essential measurements in terms of unimportant local roads, property boundaries, etc., the names of which do not appear on any maps in his reports nor on any other maps which the reviewer has been able to find. Otherwise the report is well illustrated with geological maps and diagrams and a dozen typical photographs of the region.

D. W. JOHNSON.

GENZMER, MARTHA. **Das Fischergewerbe und der Fischhandel in Mecklenburg vom 12. bis zum 14. Jahrhundert.** Bibliogr. *Archiv für Fischereigeschichte,* 1915, Oct., No. 6, pp. 157-212. Berlin.

LAY, J. G. **Germany's Exports to United States in 1915.** *Commerce Repts.,* 1916, No. 47, pp. 792-795. Bureau of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C., 1916.

LUDWIG, WILHELM. **Der Einfluss des Krieges auf die deutsche Seeschiffahrt.** *Weltwirtschaft,* Vol. 5, 1915, No. 9, pp. 187-191. Berlin.

MARTELL, P. **Zur Geschichte der Perlenfischerei in Sachsen.** *Archiv. für Fischereigeschichte,* 1915, Oct., No. 6, pp. 248-253. Berlin.

SCHMUTZER, —. **Zur Geschichte der Fischerei im Flussgebiet des Regen (Oberlauf).** *Archiv. für Fischereigeschichte,* 1915, Oct., No. 6, pp. 254-259. Berlin.

RUSSIA

FRIEDERICHSEN, MAX. **Die Grenzmarken des Europäischen Russlands, ihre geographische Eigenart und ihre Bedeutung für den Weltkrieg.** 148 pp. L. Friederichsen & Co., Hamburg, 1915. 9½ x 6½.

Professor Friederichsen's book is the product partly of his own experiences in travel in Russia (1897, 1902) and partly of the work started in Germany in 1913 by the "German Society for the Study of Russia." In spite of the fact that the activities of the society have been postponed indefinitely because of the war, this book was published as its analytical studies of the Russian frontier have a direct bearing on the present situation.

The introductory chapter deals with Russia as a whole, its expansion from the earliest days, its actual area, the size and character of the population. Then follow chapters taking up the various regions in detail, beginning with Finland. The author first outlines the geology of the country and then accords a brief paragraph each to climate, vegetation, natural resources, and population, before going more fully into what he designates as the political-geographical side of Finland. These paragraphs have distinctly more of the political than of the geographical in their character and are hardly written in what is usually called the cold light of science. A concluding page deals with the geographical conditions from the point of view of military manoeuvres, weighing the possibilities and the impossibilities of handling an army in a country of a thousand lakes, marshes, rivers, and forests.

In like manner, and with greater or less detail, he describes in turn the Baltic Provinces, Poland, Little Russia, and finally the Caucasus, laying particular emphasis on Armenia. Scattered throughout the book there is a certain amount of useful information,

but the interlardings of political propaganda are so frequent and copious that one is soon aware of the fact that in this case science is but the shell used to contain much extraneous matter. E. K. REYNOLDS.

BALKAN STATES, INCLUDING RUMANIA

QUINN, D. D. **Helladian Vistas.** 407 pp. Yellow Springs, Ohio, 1908. 8 x 5½.

The title is a good index to the content and character of the book, for it is a series of sketches. As the author says (p. 4): "These essays present, in a loosely correlated way, all kinds of information connected with the long life of a portion of the Greek nation." The chapter headings include such widely separated topics as The Acropolis of Athens, The Games at Olympia, The Mystic Rites of Eleusis, Delphi, Kephallenia, Pan-Hellenic Writing in the Aegean, The Hill of Hissarlik, The Maniats, The Church of Greece, The Land of the Klephts, Higher Education in Greece of Today, etc. Though so versatile in the choice of topics, the author has not aimed to be universal. Thus, though describing in detail each of the Ionian islands, he does not include any of those of the Aegean nor Crete.

The writer throughout shows a deep love and sympathy for his subject, a wide knowledge and impartial use of sources, and, best of all, a first-hand acquaintance with the places described, which is especially valuable in the case of such little-known parts of Greece as Ithaca, Maina, Agrapha, and the Pindus region. He has a fascinating English style, and his attention is often drawn by curious and recondite bits of history and lore—one of the attractions of the book. Thus in Zante he mentions the curious wells of pitch and how his guide gathered the pitch by dipping in a bunch of leaves tied to the end of a pole, exactly as is described in the pages of Herodotus. He speaks of the peculiar ownership of olive groves on Leucas (pp. 282-283), and the use of Leucadian red wine in export (p. 285) to France and Italy to darken their wines and says it is "so full of color that one could easily write with it."

The book is full of knowledge of every sort—perhaps too full. The author aims to tell in detail the historical setting of every place he visits. Thus it must lack the delicate and comprehensive touch of Mahaffy's "Rambles," or the personal anecdotes of Manatt's "Aegean Days," or the joyous freshness of Richardson's "Vacation Days in Greece," and the compelling charm of Mrs. Bosanquet's recent book. Doctor Quinn gives few personal experiences, is almost epic in his desire to efface himself from his pages, and is content to let the places visited tell their own tale. The lack of photographs, to help the reader reconstruct the scenes so beautifully described, is a real loss.

Certain of his descriptions, as those of the views from the top of Pankrator on Corfu (pp. 240-241) and Aenos on Cephallenia (pp. 317-318) are excellent; sometimes, as in describing the savage scenery of Tempe, he is even poetic. What he says of ancient notions of scenery can now be supplemented by a recent article of the reviewer, entitled "The Ancient Appreciation of Mountain Scenery" (*Classical Journ.*, Vol. 11, 1915-16, No. 2, pp. 70-84). His insight into the character of the Greek of today is constantly shown, e. g. on page 282, where, in speaking of the custom of the Leucadian grandee to while away an hour with his friends at the café in talking politics, he pictures him as "like a true Greek, condemning everything, without, however, expressing or even possessing an opinion of his own on the matter under discussion."

In reviewing a popular book so charmingly written as this it seems wrong to offer more than very general criticisms. In the "Games at Olympia" the author has rightly exposed the fallacy, still appearing in every textbook of ancient history, that the Greeks were never united, by affirming that they were as closely united, though in a very different way, as the citizens of any modern state. He is right in saying that phyletic union is a far nobler kind than the equality of fellow subjects. However, he does not give due prominence to the political leadership of Athens in the modern sense, which grew out of the Delian league, for, in a passage in which he says it was a mistake to have chosen the present as the capital of Greece, he says (p. 19) that this was an honor "which in all her long and varied history had never before fallen to the lot of Athens, to be a capital of a state."

His ethnological views are not always tenable. Just why he should say (p. 174) that the presence of Slavonic place-names in Arcadia is "one of the mysteries of Arcadian and mediæval Greek history in general" is not clear. Nor are his doubts about the origin and language of the Vlachs of Great Vlachia in the Pindus well founded. He says they may be akin to the Wallachians of Rumania, but that there is not the slightest proof that they came into the Pindus and Othrys from the Danubian provinces, and he professes to be in complete ignorance about their original home, and only their speech is Latin; "whether they are of Greek descent or not has not been ascertained. Their ethnic origin is as much open to dispute as is that of the

Roumanians themselves" (p. 166). He is here evidently a disciple of Roesler, whose work "Romanische Studien" (Leipsic, 1871) absolutely denied the claims of the Rumanian and Transylvanian Vlachs to be regarded as descendants of Trojan's Dacians. This theory at first commanded wide acceptance and was even utilized in Hungary as a plea for refusing parity of treatment to what was looked upon as a race of comparatively recent intruders. But Rumanian scholars (e. g. J. L. Pic: Über die Abstammung der Rumänen, Leipsic, 1880; and A. D. Xenopol: Les Roumains au moyen âge, Jassy, 1886) showed the fallacy of Roesler's conclusions, which were received in Rumania much as Fallmerayer's notions of the ethnology of the Greeks had been received long before in Greece—as a direct attack on their nationality. Doubtless the truth of the matter lies somewhere between the two extremes. Despite the long predominance of Greek, Slav, and Turk influence, no valid objection can be made to the claim of the half million Vlachs, scattered south of the Danube over Macedonia and northern Greece, that they are of Latin origin in language and culture and to some extent also in descent. Competent ethnologists of today generally accept it. It is not the Latin descent of the Vlachs which is hard to prove, but their place of origin and early migrations. That they were in Thessaly by the eleventh century is attested by Anna Comnena, who mentions *Megale Vlachia* then; and in the next century they were described by the Jew Benjamin of Tudela.

Perhaps the one thing in the book with which the classical scholar would find serious fault is Doctor Quinn's mode of transcribing ancient Greek names. The use of *k* for *c* and the endings *-os* and *-on* for the more usual *-us* and *-um* (e. g. Kallimachos, Byzantion) is merely a matter of taste and quite proper. But why assimilate only the dipthongs *eu* and *au* into the Romaic pronunciation *ev* and *av* and not consistently rewrite the consonants? Thus he writes Evripides, Odysseys, Zevs, Evboean, Elevsis, and even Peiræevs; also Pavsanias, Aristonavtes, Navplion. Of course sometimes in certain combinations we should have *ef* and *af*, and so write Pafsanías and, with the necessary consonant changes, Otheesefs and Evripithes. The initial consonant *beta* is left though it is now pronounced as a *v;* so instead of Doctor Quinn's Bolos, we should have Volos (especially as the town is scarcely a hundred years old and has no ancient equivalent), and instead of Belestino we should have Velestino. The word constantly spelled *katabothron* should be written *katavothron*—as it is not an ancient Greek word. The names of the Ionian islands Corfu, Cephalonia, and Zante, coming to us through the Italian, would also seem preferable to their little-known Greek names Kerkyra, Kephallenia, and Zakynthos in a popular work of this sort. Mainotes is better known than Maniats and Romaeic should consistently replace Romaean and Kladeos should be written for Kladoas, Olympic for Olympiac; nor are the shortened forms Palaeolog, Dikeareh, Phenik (p. 112) naturalized in English; he even gives Akadem (p. 18). Such inventions as Bulgarmen, Delphmen, Mykenlanders, Greekland (three times on p. 354) and un-Greekly, are doubtful at best.

But despite such minor defects, "Helladian Vistas" is an excellent book and should claim a large circle of readers. WALTER WOODBURN HYDE.

—— **Patras, Consular District of (Comprising the Morea and the Provinces of Ætolia and Acarnania), Trade of the, Report for the Year 1914 on the.** 12 pp. Map. *Diplomatic and Consular Repts.*, Ann. Series, No. 5556. London, 1916.

AFRICA

SAHARA, INCLUDING EGYPT

BALLS, W. L. **Egypt of the Egyptians.** xvi and 266 pp. Maps, ills., index, bibliogr. Charles Scribner's Sons, New York, 1915. 7½ x 5½.

Mr. Balls has here compacted a great amount of information and made it readable. He scarcely gives so vivid a picture of Egypt in the large as Sydney Low in his latest book, but he discusses so fully such matters as irrigation and its processes; climate; crops and machinery; the varied population, including the *fellaheen*, the Bedouin, and the foreigner; the past, the present, and the hoped-for future of the ancient land, that he materially helps us to visualize what Egypt has been and is and what it may become. It is a small book, easy to handle and packed with well-arranged facts and helpful comment.

The author might, with advantage, have enlarged upon the data he gives concerning the *sudd* of the upper White Nile which holds the waters from the equatorial lakes till more than half the volume evaporates. What Egypt needs for the reclamation of more land is all the water it can get. It is the present policy of the British occupation to secure this water by closing all the inlets into the marshes and widening and deepening

the channel. The *sudd* itself may be turned to good account. Just before the war, a method was discovered of converting dried and pressed blocks of this floating vegetation into fuel and a company was beginning to carry out the process.

CYRUS C. ADAMS.

DE KUSEL (BEY), BARON. **An Englishman's Recollections of Egypt, 1863 to 1887,** With an Epilogue Dealing With the Present Time, 1914. xvi and 352 pp. Map, ills., index. John Lane Co., New York, 1915. $3. 9 x 6.

The memoirs of an English gentleman, former English controller-general of Egyptian customs. He went to Egypt at the age of fifteen and began life as accountant and paymaster in an Egyptian cotton mill. Two years afterwards he secured a position with an English firm of merchants and steamship agents at Alexandria. Seven years later he entered the Egyptian customs service and was appointed chief of the administrative department. His personal experiences gave him an inside view of more recent Egyptian history. He sums up England's work in Egypt in a few words: "The *fellaheen* know full well how they have been treated in the past: for the slightest offence they have been whipped with the *kourbash*, taxed over and over again, deprived of their lands, and treated with the greatest injustice. Now they are treated with the greatest justice, taxed equally, and are treated as human beings."

BIANCO, M. Z. **Il Canale di Suez nel 1914.** 17 pp. [*Boll.*] *Direz. Gen. degli Affari Commerc.*, 1915, No. 18. Minist. degli Affari Esteri. Rome.

CAMPANI, ROMEO. **La terminologia geografica degli Arabi, con speciale riguardo alla toponomastica della Libia.** *La Geogr.*, Vol. 3, 1915, No. 1-2, pp. 34-47; No. 7-10, pp. 337-347. Novara.

CATALANI, GIACOMO. **Zavia (Garbia).** *L'Esplorazione Commerc.*, Vol. 30, 1915, No. 1, pp. 22-27; No. 4, pp. 133-138; No. 7, pp. 273-279; No. 10-11, pp. 419-424; No. 12, pp. 457-461. [Zavia is a coastal town 25 miles west of Tripolis.]

—— **Egypte, Bulletin mensuel du commerce extérieur de l', avec appendice sur le Soudan: Décembre 1915.** (Vol. 29, No. 12.) 35 pp. Direction Générale des Douanes Egyptiennes, Alexandria.

MADAGASCAR AND ADJACENT ISLANDS

CARLE ET GOHIER, G. **Contribution à l'étude des terres de la côte est [de Madagascar].** *Bull. Econ. du Gouv. Gén. de la Colon. de Madagascar et Dépend.*, Vol. 15, 1915, No. 1, pp. 35-41. Tananarive.

DE LA BATHIE, P. **Études et recherches pour la captation des eaux thermales d'Antsirabe [Madagascar].** Map, diagr. *Bull. Econ. du Gouv. Gén. de la Colon. de Madagascar et Dépend.*, Vol. 15, 1915, No. 1, pp. 93-103. Tananarive. [Contains notes on the geology, accompanied by a contoured geological map, 1:100,000.]

FAVIER, —, AND VIDAL, —. **Les plantes de Madagascar propres à la fabrication du papier: Études faites à l'École Française de Papeterie.** *Bull. Econ. du Gouv. Gén. de la Colon. de Madagascar et Dépend.*, Vol. 15, 1915, No. 1, pp. 80-87.

—— **Madagascar, Étude sur la sériciculture à.** *Bull. Econ. du Gouv. Gén. de la Colon. de Madagascar et Dépend.*, Vol. 15, 1915, No. 1, pp. 1-17. Tananarive.

—— **Mauritius: Report for 1914.** 36 pp. Map. *Ann. Colonial Repts. No. 875.* London, 1916. [With a record crop and high price, the sugar industry of the island is in a sound financial condition.]

ROULLEAU, A. **L'arboriculture fruitière d'Europe: Son application et ses résultats en Emyrne, [Madagascar].** *Bull. Econ. du Gouv. Gén. de la Colon. de Madagascar et Dépend.*, Vol. 15, 1915, No. 1, pp. 18-34. Tananarive.

ASIA

TURKEY IN ASIA, ARABIA, CAUCASIA, IRAN

BISSOLI, LUIGI. **Alcune notizie di geografia commerciale sulla Persia.** *L'Esplorazione Commerc.*, Vol. 31, 1916, No. 1, pp. 1-10.

D'AGOSTINO, P. O. **Francesi ed Inglesi in Siria.** *Riv. Coloniale*, Vol. 10, 1915, No. 6, pp. 316-325. Rome.

DEHÉRAIN, HENRI. **Les attaques contre le canal de Suez.** Map, ills. *La Nature*, No. 2208, 1916, Jan. 22, pp. 56-60. [Discusses, with map, the possible routes of attack on the Suez Canal.]

ENRICO, DELLA VALLE. **Grandezza e decadenza del popolo Ottomano.** *Riv.*

Militare Italiana, Vol. 60, 1915, No. 10, pp. 2023-2056; No. 11, pp. 2129-2163; No. 12, pp. 2333-2400. Rome.

MACDONALD, J. B. **The Anglo-Russian Campaign in Turkey.** Map, ills. *Amer. Rev. of Reviews*, Vol. 53, 1916, No. 4, pp. 439-448. [The second of the three sections into which this article is divided is on the strategic geography of the Turkish Empire.]

MAROLLO, CARLO. **Allevamento e commercio del baco da seta in Persia.** 12 pp. [*Boll.*] *Direz. Gen. degli Affari Commerc.*, 1915, No. 19. Minist. degli Affari Esteri. Rome. [Silk-worm cultivation.]

MALAY ARCHIPELAGO, INCLUDING THE PHILIPPINES

BROUWER, H. A. **On the Granitic Area of Rokan (Middle-Sumatra) and on Contact-Phenomena in the Surrounding Schists.** Map, diagrs. *Proc. Section of Sciences, Kon. Akad. van Wetenschappen te Amsterdam*, Vol. 17, Part 2, pp. 1190-1202. June, 1915.

CORONAS, JOSE. **Philippine Islands: Meteorological Bulletin for June, 1915.** pp. 103-119. Map. Weather Bureau, Manila, 1915.

HEEKEREN, E. A. A. VAN. **Nederlandsch Oost-Indië in 1915.** *De Indische Gids*, Vol. 38, 1916, No. 2, pp. 178-189. [Review of economic development.]

H[EEKEREN], E. A. A. V[AN]. **Jaarverslag van den Topografischen Dienst in Nederlandsch-Indië over 1914.** *De Indische Gids*, Vol. 38, 1916, No. 1, pp. 31-35. [A review of the report for 1914 of the Topographical Bureau of the Dutch East Indies.]

MOULTON, J. C. **An Account of the Various Expeditions to Mt. Kinabalu.** Map. *Sarawak Museum Journ.*, Vol. 2 (Part 2), 1915, No. 6, pp. 137-176. [Summary accounts of all the ascents made by Europeans from the first in 1852 to the author's own climb of 1913. For an account of the plant formations of this peak in British North Borneo see the paper by L. S. Gibbs listed in the Feb. *Review*, p. 162.]

WICHMANN, A. **On the Tin of the Island of Flores.** Map. *Proc. Section of Sciences, Kon. Akad. van Wetenschappen te Amsterdam*, Vol. 17, Part 1, pp. 474-490. Dec., 1914.

WICHMANN, A. **On Some Rocks of the Island of Taliabu (Sula Islands).** Diagrs. *Proc. Section of Sciences, Kon. Akad. van Wetenschappen te Amsterdam*, Vol. 17, Part 1, pp. 226-239. Dec., 1914.

Oversichtskaart van het eiland Borneo. 1:2,000,000. Topographische Inrichting, Batavia, 1909 (corrections to 1914).

Erfpachtsperceelen in de residentie Lampongsche Districten, [Sumatra]. 1:500,000. Topographische Inrichting, Batavia, 1914.

Overzichtskaart van de residentie Semarang, [Java]. 1:250,000. Topographische Inrichting, Batavia, 1914.

Der westliche Teil von Seran, nach den Aufnahmen von O. D. Tauern, E. Stresemann und eigenen, mit Benützung einer holländischen Aufnahme des Uligebietes und der von Leutnant 1. Kl. W. K. H. Feuilleteau de Bruin aufgenommenen Route Honitetu-Kairatu, entworfen vor K. Deninger. 1:125,000. Pl. 50, *Petermanns Mitt.*, Oct., 1915. [See also maps listed in *Bull. Amer. Geogr. Soc.*, Vol. 47, 1915, pp. 75 and 397-398.]

Anchorages west and south of Mindoro, P[hilippine] I[slands]. (1) Sablayan Anchorage and Pandan Bay, west coast of Mindoro; (2) Semirara Anchorage, west coast of Semirara Island; (3) Apo Reef, Mindoro Strait. 1:20,000. Chart No. 4337, U. S. Coast & Geodetic Survey, Washington. Edit. of Jan., 1916. Price, 30 cents.

PHYSICAL GEOGRAPHY

HYDROGRAPHY AND OCEANOGRAPHY

HESSELBERG, T., AND H. U. SVERDRUP. **Beitrag zur Berechnung der Druck- und Massenverteilung im Meere.** 17 pp. *Bergens Museums Aarbok 1914-1915: Avhandlinger og Aarsberetning*, No. 3, Art. 14.

HESSELBERG, T., AND H. U. SVERDRUP. **Die Stabilitätsverhältnisse des Seewassers bei vertikalen Verschiebungen.** 16 pp. *Bergens Museums Aarbok 1914-1915: Avhandlinger og Aarsberetning*, No. 3, Art. 15.

MCEWEN, G. F. **The Application of Physical Principles to Problems Suggested by Oceanic Circulation and Temperatures.** *Monthly Weather Rev.*, Vol. 43, 1915, No. 12, pp. 620-621. [Abstract of a paper presented at the San Francisco joint meeting of the Physical Society and Section B of the A. A. A. S., Aug. 2-7, 1915.]

Meteorology and Climatology

Hennig, R. **Vom Wetter: Gemeinverständliche Betrachtungen über Wind und Wetter und ihr Einfluss auf den Krieg.** 96 pp. Deutsche Naturwissenschaftliche Gesellschaft, Leipzig, 1915. M. 1. 8½ x 5½.

Weather conditions have exercised a control over military operations ever since human wars and battles began. The control is so universal, so important, so critical, that for a military staff to neglect the weather factor in warfare may be as disastrous as a failure to provide food, or water, or ammunition. Singularly little has been written on this subject, although history is full of illustrations of weather influences in wars. The present reviewer has already published several articles on the importance of the weather factor in the present war. This is the first book to discuss the topic.

Doctor Hennig has done exactly what the title of his little volume implies. He has given a simple and popular presentation of various types of weather. He has shown, by means of numerous historical references, the relation which has appeared in past wars between weather conditions and military operations. And he has not neglected to include numerous cases in the present war where such relations have been clearly observed. So far as possible, the author has worked out from the available data the actual meteorological conditions which prevailed during the first year of the war, and has thus been able to compare these with the usual, normal conditions. He shows, for example, that the winter of 1914-15 was, on the whole, an unusually mild one, the minimum temperatures in eastern Europe having generally been 15°, or more, higher than the average.

About one-third of the book deals with the control of battles and campaigns by cold, heat, thunderstorms, rain, fog, and storm. A few pages are devoted to the supposed effect of battles upon the weather. The conclusion, of course, is that there is absolutely no evidence, statistical or theoretical, in favor of the view that wars in general, or the present war in particular, have ever had even the slightest influence upon the weather. The hygiene of precipitation, frost protection, hail damage, fear of and danger from thunderstorms, Christmas-tide weather, and several other topics of popular interest are briefly and clearly discussed. Doctor Hennig's little book is easily read, interesting, and instructive. It will set its readers right on a good many widespread meteorological errors and superstitions. And it puts emphasis upon the human importance of the conditions with which it deals. R. DeC. Ward.

Litre, E. **La science de l'air: Notions nouvelles et utilisation.** *Bull. Soc. de Géogr. de Toulouse,* Vol. 34, 1915, No. 2, pp. 134-151.

McAdie, Alexander. **Battles and Rainfall.** *Scientific Monthly,* Vol. 2, 1916, No. 2, pp. 170-173.

—— **Radio-Active Substances in the Air and Atmospheric Fog: A Study of Atmospheric Conditions of Importance to the Aviator.** Map, diagr., ills. *Sci. Amer. Suppl.,* No. 2089, Vol. 81, 1916, Jan. 15, pp. 37-38.

Wells, E. L. **The Economic Aspect of Climatology.** *Monthly Weather Rev.,* Vol. 43, 1915, No. 12, pp. 612-613. [Author's abstract of a paper read at the Pan American Scientific Congress in Washington, Dec., 1915-Jan., 1916.]

HUMAN GEOGRAPHY

Anthropology and Ethnology

Elliot, G. F. S. **Prehistoric Man and His Story: A Sketch of the History of Mankind from the Earliest Times.** 398 pp. Diagrs., ills., index. Seeley, Service & Co., Ltd., London (J. B. Lippincott Co., Philadelphia, Amer. Agents), 1915. $2. 9 x 5½.

A summing up of our present knowledge concerning prehistoric man, drawn from every field of science. The book is somewhat removed from the ordinary by the happy welding of geological, anatomical, zoölogical, archeological, and ethnological facts. Man's ascent by successive steps of achievement is recorded, and there is a subtle appeal in the imaginative description of the life of our primitive ancestors.

There is here and there an occasional insight into the relations of the savage to his environment. But the want of a better grasp of this subject is felt in the chapters on the occupation of world-areas. The author has evidently not drawn on geography to the extent to which he has assumed indebtedness to other sciences.

The title of "The American Puzzle" given to the pages dealing with New World conditions hardly seems warranted any longer, in view of Hrdlička's discoveries in Asia

during 1912. Had stress been laid on the fundamental unity of the Pacific region the problem of its peopling would have been presented in its proper light. In spite of such shortcomings, the laborious task of reconstitution undertaken by the author has been on the whole ably achieved.

ELLIOT, G. F. S. **Prehistoric Man.** *Proc. Royal Philos. Soc. of Glasgow*, Vol. 45, 1913-14, pp. 17-27.

HAHN, EDUARD. **Menschenrassen und Haustiereigenschaften.** *Zeitschr. für Ethnologie*, Vol. 47, 1915, No. 2-3, pp. 248-257. Berlin. [Comparison of environmental influences on man and on domestic animals along the lines of the author's suggestive "Die Haustiere und ihre Beziehungen zur Wirtshaft des Menschen: Eine geographische Studie," 1896.]

ROOSEVELT, THEODORE. **How Old Is Man?** Maps, ills. *Natl. Geogr. Mag.*, Vol. 29, 1916, No. 2, pp. 111-127. [A review of "Men of the Old Stone Age: Their Environment, Life, and Art," by Henry Fairfield Osborn, New York, 1915.]

WOODWARD, A. S. **A Guide to the Fossil Remains of Man in the Department of Geology and Palæontology in the British Museum.** 33 pp. Ills., bibliogr. London, 1915.

ECONOMIC GEOGRAPHY

TODD, J. A. **The World's Cotton Crops.** xiii and 460 pp. Maps, diagrs., ills., index. A. & C. Black, Ltd., London, 1915. 10s. 8 x 5½.

The author holds that the world is facing an increasing demand for cotton, a demand due to the spread of civilization and its consequent demand for more clothes, to the substitution of cotton for the more expensive woolen, linen, and silken fabrics, and to the constantly widening use of cotton cloths in new industries. All the cotton-producing regions of the world are described and illustrated with excellent maps, statistical tables and graphs, but especial emphasis is given to the United States, India, and Egypt, the latter two because of their importance as cotton-producing British colonies.

Broadly considered, the author divides the world's cotton into five grades: Sea Island cotton of South Carolina and the West Indies; Sea Island cotton of Georgia and Florida; Egyptian cotton; American upland cotton; and, lowest in grade, Indian cotton. The American upland (short staple) cotton includes sixty per cent of the world's supply. The prices show a greater increase than the production, thus showing a demand that, on the whole, has increased faster than the supply. The increasing cost of production according to the author's analysis is due to the boll weevil and to the inefficient negro labor so largely employed in the South.

Indian cotton is of poor quality and does not reach the world's markets in large quantities. Egyptian cotton is of good quality, and the arable lands are being increased by irrigation, especially since the building of the Assuan dam. An interesting problem has appeared in connection with Egyptian irrigation. With the increase of water for irrigation there is a rise of subsoil water so that drainage ditches have become almost as necessary as irrigation canals. Another very interesting fact hitherto not known to the reviewer is that recent observations in Egypt show a tendency toward a seven-year cycle of the Nile overflows, seven years of plentiful water followed by seven years of less plentiful water—a condition well known in our subarid West. There are chapters on the uses of cotton and cotton seed.

A final chapter is given to the effects of the great war on the cotton situation. Production in the United States has already been reduced because of the war, and at the close of the war there will probably be a heavy demand from the warring nations for cheap cotton goods to take the place of the more expensive goods that were formerly consumed. The author is inclined to doubt if the production of raw cotton will quickly rise to meet the probable increased demand. F. V. EMERSON.

DRYER, C. R. **Natural Economic Regions.** *Annals Assoc. Amer. Geogrs.*, Vol. 5, 1915, pp. 121-125. [Abstracted in the May number, p. 378.]

SHOWALTER, W. J. **How the World is Fed: (A Practical Analysis of the Food Supply of the World, of the Relations of War and Science Thereto, and of America's Great Contribution to Humanity's Market Basket.)** Ills. *Natl. Geogr. Mag.*, Vol. 29, 1916, No. 1, pp. 1-110. [With over one hundred illustrations.]

HARPER, E. H., AND ALLAN FERGUSON. **Aerial Locomotion.** (Series :The Cambridge Manuals of Science and Literature.) viii and 164 pp. Diagrs., ills., index, bibliogr. Cambridge University Press, London, 1911. 40 cts. 7 x 5.

HISTORY OF GEOGRAPHY AND EXPLORATION

McClymont, J. R. **Pedraluarez Cabral (Pedro Alluarez de Gouvea): His Progenitors, His Life, and His Voyage to America and India.** 73 pp. Bernard Quaritch, London, 1914. 9 x 7½.

The geographical part of the volume takes the form of a brief and not very enlightening commentary on the voyage of Cabral, Vasco da Gama's not too fortunate successor, followed by translations of relevant documents, such as the Royal Instructions for Trading with the Indies, as appendices. Whatever may be the opinion on Cabral's East Indian policy (see A. G. Keller's "Colonization," p. 92), his voyage, as the author points out, is marked by two notable achievements—the effective discovery of Brazil for Portugal and a knowledge of the climate of the South Atlantic that proved of great service to succeeding navigators.

McGee, E. R. **Life of W J McGee.** 240 pp. Ills., bibliogr. Privately printed, Farley, Iowa, 1915. $2.00. 8 x 5½.

As a biography this book is defective both in literary style and in analysis of a many-sided character whose geographic papers are of high rank; but the author—sister of the late W J McGee—at least gives detailed descriptions of the early life of the subject which are both intimate and valuable. There is a bibliography of 111 titles, arranged in chronological order except for about sixteen titles (some dated 1911) taken out of sequence and put without order at the beginning of the list.

An important feature of the work is a series of extracts from McGee's principal writings. Among them are such famous papers as "The Seri Indians" and "Desert Thirst as Disease." The last writing included is "Symptomatic Development of Cancer"—a few notes on the growth of the disease which finally ended the author's life.

Churchill, William. **Memoir of William W. Rockhill.** *Annals Assoc. Amer. Geogrs.*, Vol. 5, 1915, pp. 131-133.

Clarke, J. M. **The Reincarnation of James Eights, Antarctic Explorer.** *Scientific Monthly*, Vol. 2, 1916, No. 2, pp. 189-202. [Eights, a native of Albany, N. Y., was a member of Fanning's expedition of 1830 and made accurate observations on the geology of the South Shetland islands. Although appointed geologist of the Wilkes Exploring Expedition of 1840, he was in the last moment omitted from its scientific staff. This failure marked the end of his scientific career, although he lived until 1882.]

EDUCATIONAL GEOGRAPHY

Kahn, Joseph, and J. J. Klein. **Principles and Methods in Commercial Education: A Text-Book for Teachers, Students and Business Men.** xiv and 439 pp. Index. The Macmillan Co., New York, 1914. $1.40. 8 x 5½.

This volume, by two authors of much special experience, appears to be a timely and strong exposition of a theme of growing importance. It is designed to give a pedagogical foundation to the teacher and a wider outlook to the man of business. Part I is general and deals with the value of a business education, the course of study in secondary commercial schools, and the general principles of method. Part II constitutes most of the volume and is devoted to special fields. Among them are arithmetic, office practice, bookkeeping, commercial geography, commercial law, economics, business English, and stenography.

Commercial geography is characterized as the broadest of all the subjects in the curriculum. The difficulty is emphasized of dealing with principles rather than facts of memory, as also the importance of an introductory course in local industries. Concrete suggestions are given on the method of such study. Many other sub-topics are well treated, as for example the physiographic conditions which influence commerce, human factors in commerce, selection and organization of material, use of text and reference books, observation trips and commercial museums, maps and graphs. Each chapter closes with practical exercises and a bibliography. Albert Perry Brigham.

Hanna, J. C. **General Science and Geography in the High School.** *School Sci. and Math.*, Vol. 16, 1916, No. 3, pp. 210-217.

von Engeln, O. D., and L. A. Hausman. **An Automatic, Intermittent Eruption, Artificial Geyser.** Diagrs., ills. *School Sci. and Math.*, Vol. 16, 1916, No. 2, pp. 116-122. [Directions for the construction of a geyser model.]

Whitbeck, R. H. **Geography as a Preparation for Citizenship.** *School Sci. and Math.*, Vol. 16, 1916, No. 4, pp. 323-327.

Wunderlich, E. **Geographische Universitäts-Ferienkurse.** *Geogr. Anzeiger*, Vol. 16, 1915, No. 12, pp. 359-360.

ERRATA

p. 50, line 4: *for* Trapajoz *read* Tapajoz

p. 50, line 4 from bottom: *for* Matto Crosso *read* Matto Grosso

p. 71, line 1 of fourth entry: *for* Reseign. Colon. *read* Renseign. Colon.

p. 77, line 3 of second entry: *for* Niederländish *read* Niederländisch

p. 84, line 1 of second entry: *for* Eiszeitmenchen *read* Eiszeitmenschen

p. 137, line 7 of first column: *for* Jorge A. Boerol *read* Jorge A. Boero

p. 137, first item: *to list of lectures before the Society add* Margaret C. Bolles, December 6, 1915, on "The Shore and Hinterland of the Northeast Adriatic"

p. 146, line 6: *for* brought them *read* brought it

p. 150, line 1: *for* H. C. Dyar *read* H. G. Dyar

p. 169, line 4 from bottom: *for* Heinisch *read* Reinisch

p. 177, line 15 from bottom: *for* haults *read* halts

p. 213, line 1 of footnote 1: *for* Tiefenkarte *read* Tiefenkarten

p. 253, line 10: *for* Dnieper *read* Dniepr

p. 307, line 14: *for* Secretary *read* Acting Director

p. 316, line 2 of third entry: *for* No. 190 *read* No. 19o

p. 319, line 1 of Sixth item and line 2 of eighth item: *for* Bol. Real Soc. Geogr. *read* Rev. de Geogr. Colon. y Mercantil

p. 387, line 1 of third entry from bottom: *supply author's name,* ALBES, EDWARD

p. 388, top: *above* BRITISH ISLES *insert center heading* EUROPE

p. 450, map: *the region about the head of Danmark Fiord should be revised according to* Meddelelser om Grønland, *Vol. 52, Pt. I*

OFFICERS AND COUNCILORS FOR 1916

President

JOHN GREENOUGH

Vice-Presidents

JAMES B. FORD
Term expires 1919

PAUL TUCKERMAN
Term expires 1917

ANTON A. RAVEN
Term expires 1918

Foreign Corresponding Secretary

PROFESSOR WILLIAM LIBBEY
Term expires 1918

Domestic Corresponding Secretary

ARCHIBALD D. RUSSELL
Term expires 1917

Recording Secretary

HAMILTON FISH KEAN
Term expires 1919

Treasurer

HENRY PARISH, JR.
Term expires 1917

Councilors

CHARLES H. TWEED
MADISON GRANT
GRENVILLE KANE
ALLISON V. ARMOUR
Terms expire 1917

BANYER CLARKSON
EDWIN SWIFT BALCH
CHANDLER ROBBINS
EDMUND L. BAYLIES
WALTER B. JAMES, M.D.
Terms expire 1918

REAR-ADM. FRENCH E. CHADWICK
FRANK BAILEY
LEVI HOLBROOK
CHARLES A. PEABODY
ARCHER M. HUNTINGTON
Terms expire 1919

Editorial Staff

ISAIAH BOWMAN, Ph.D., Director
W. L. G. JOERG
LEON DOMINIAN
G. M. WRIGLEY

Contributing Editors

ALBERT PERRY BRIGHAM, A.M., Colgate University
WILLIAM M. DAVIS, Hon. D.Sc., Ph.D., Harvard University
WILLIAM CHURCHILL, F.R.A.I., The Carnegie Institution of Washington
ROBERT DeC. WARD, A.M., Harvard University
RICHARD E. DODGE, A.M., Teachers College, Columbia University
ELLSWORTH HUNTINGTON, Ph.D., Milton, Mass.
MARK JEFFERSON, A.M., State Normal College, Ypsilanti, Mich.
DOUGLAS WILSON JOHNSON, Ph.D., Columbia University

OBJECTS OF THE SOCIETY

The objects of the American Geographical Society are to collect and disseminate geographical information by discussion, lectures, and publications; to establish in the chief city of the United States a place where may be obtained accurate information on every part of the globe; and to encourage such exploring expeditions as seem likely to result in valuable discoveries in geography and the related sciences.

The American Geographical Society is the oldest geographical society in the United States. When it was founded, in 1852, there were but twelve similar societies in the world. Now it exchanges publications with more than four hundred scientific associations. The Society issues a monthly magazine of unusual interest called *The Geographical Review.* It has also a large and growing library—one of the most important geographical libraries of the world; thousands of maps and charts; and a remarkable collection of atlases of the sixteenth, seventeenth, and eighteenth centuries.

Travelers, men of science, and others properly accredited are welcome at the rooms of the Society and may freely use the book and map collections.

Two gold medals have been founded by the Society, the *Cullum Geographical Medal* and the *Charles P. Daly Medal,* which are awarded from time to time to explorers, writers, and men of science who have contributed to the advance of geographical knowledge.

In addition it awards the *David Livingstone Centenary Medal,* founded by the Hispanic Society of America.

The qualifications for Fellowship are an interest in exploration and travel, in the spread of geographical knowledge, and in the advancement of science.

A Fellow is entitled to the use of the Library, Reading and Map Rooms; to admission to all lectures and exhibitions; and to the Society's current publications, which include, besides the magazine, occasional books and maps.

The annual dues are ten dollars.

FORM OF BEQUEST

I do hereby give and bequeath to the American Geographical Society of New York .....